FLIGHT

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Founder and Editor: STANLEY SPOONER

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CONTENTS

DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list:—

1932.
Dec. 1. "The Behaviour of Fluids in Turbulent Motion." Lecture by Mr. A. Fage, A.R.C.Sc., F.R.Ae.S., before R.Ae.S.
Dec. 2. Hampshire Ae.C. Annual Dinner and Dance.
Dec. 2. Yorkshire Ae.C. Annual Dance, Hotel Majestic, Harrogate.
Dec. 2. A. and A.E.E. Dinner, at Martlesham Heath.
Dec. 2. No. 3 Sqdn., R.A.F., Reunion Dinner.
Dec. 2. Hampshire Ae.C Annual Dinner and Dance, at South Western Hotel, Southampton.
Dec. 3. De Havilland Works Annual Dinner, at the Wharncliffe Rooms.
Dec. 4. Close of Paris Aero Show.
Dec. 5. Hull Flying Club Annual Ball.
Dec. 6. Junior Ae.C. Annual Dinner at Ye Olde Ham Bone Clubbe, Ham Yard, Great Windmill Street, W.
Dec. 8. "Air Survey." Lecture by Lieut. J. S. A. Salt, R.E., before R.Ae.S.
Dec. 9. D.H. Technical School Students' Ball, at Portman Rooms.
Dec. 9. Kent Flying Club Annual Dance, at County Hall, Canterbury.
Dec. 10. Maidstone Ae.C. Annual Dance.
Dec. 14. "Air Power and Disarmament." Lecture by Group Capt. J. T. Babington, before R.U.S.I.
Dec. 14. London Ae.C. Annual Dinner and Dance, at Park Lane Hotel.
Dec. 15. "Lessons of the D.O.X." Lecture by Dr. C. Dornier, before R.Ae.S.
Dec. 16. College of Aeronautical Engineering Annual Dinner, and Dance, Park Lane Hotel.
Dec. 16. No. 70 Sqdn., R.A.F., Reunion Dinner.
Dec. 23. Liverpool and Dis. Ae.C. Annual Dance at Mostyn House School.

1933.
Jan. 6. Bristol and Wessex Ae.C. Dance, at Grand Spa Hotel.
Jan. 6. No. 25 (F.) Sqdn., R.A.F., Re-union Dinner at May Fair Hotel.

EDITORIAL COMMENT

WHEN the Soviet Government first sent a delegation to the Disarmament Conference, its spokesman, Comrade Litvinoff, put forward a proposal for the total abolition of all armaments. In some pacifist quarters this was hailed as practical and constructive. The proposal was certainly delightfully simple: so was the intelligence of those who believed the proposals to be genuine.

Red Russia

Very appropriately at this moment two well-informed publications have thrown real light upon the present condition of Russia. One is a book, *Red Russia Arms*,* by John Baker White, and the other a series of articles in the *Daily Telegraph* by Martin Moore, a special representative of the paper who has just returned from a tour in Russia, where he was apparently granted exceptional facilities for seeing the working of the Five-Year Plan. At the time of going to press Mr. Moore's articles have not got to the point of dealing with the Red Army or the Red Air Force, but they have set out very fairly, as it seems, the successes and failures of the Soviet in attempting to create a huge Communist economic State. The achievements have been considerable and striking, though the plan has been so ambitious that full success could scarcely have been expected in the time. The hardships of the people, chief of which is the shortage and poor quality of the food, have been heavy. Shortcomings of the Plan have been due to inexperienced organisation and to bad workmanship by untrained operatives. A great percentage of the output of the tractor factories, for instance, has been unusable, or has speedily been ruined by inexpert handling. This has a great effect on the transport problem, both for peace and for war.

Mr. White has written his book in a very restrained way, which makes his observations all the more telling. He has stuck closely to the facts which he has been able to collect, and for many of them

**Red Russia Arms.* By John Baker White. Obtainable from FLIGHT Office, 36, Great Queen Street, London, W.C.2. Price 3s. 9d. post free.

quotes authority, such as the pronouncements of Russian official publications. He never indulges in lurid descriptions calculated to make the flesh of his readers creep. Yet the picture which emerges from his marshalled facts and figures is sufficiently alarming.

Never has any State—not Zululand under the great Chaaka, nor Sparta in the golden age of Greece—been so completely militarised as is Soviet Russia under the Five-Year Plan. "The most active workers in the factories," writes Mr. White, "and on the State farms are always referred to as 'shock brigades' or 'battalions.'" "On the State farms the workers live in barracks, and are marched to and from their work. Continual references are made to the industrial 'front.' Special activities are always referred to as 'campaigns.'" Such phrases and devices might in themselves be harmless enough, but the factory workers are actually armed and partially trained as soldiers. When any military display takes place in Russia to-day the regular troops are followed on parade by serried ranks of factory workers in rough working clothes, each man carrying a rifle. It was the factory workers who originally made possible the Bolshevik Revolution. In 1917 they were an undisciplined mob. To-day, says Mr. White, they are "an enormous disciplined auxiliary of the Red Army." A recent publication of the Soviet State Publishing House stated that "the militarisation of industry is of prime importance to the Red Army." Mr. Baker estimates the total forces of the Soviet as 1,185,000 men, of whom 438,000 are Territorial units, conscripts, and youths undergoing training. In a long campaign he believes that Russia could put 17 million men into the field. Whether she could transport them and feed them, and what their fighting value would be, are questions which cannot now be answered. Still, he is convinced that the soldiers, the equipment, the transport, and other matters are better than they were in 1914. The transport is still one of the weakest points, and another is the poor education of the Red officers. In 1914 Russia made herself felt; and Mr. Baker considers that she is in a position to do better in many respects now.

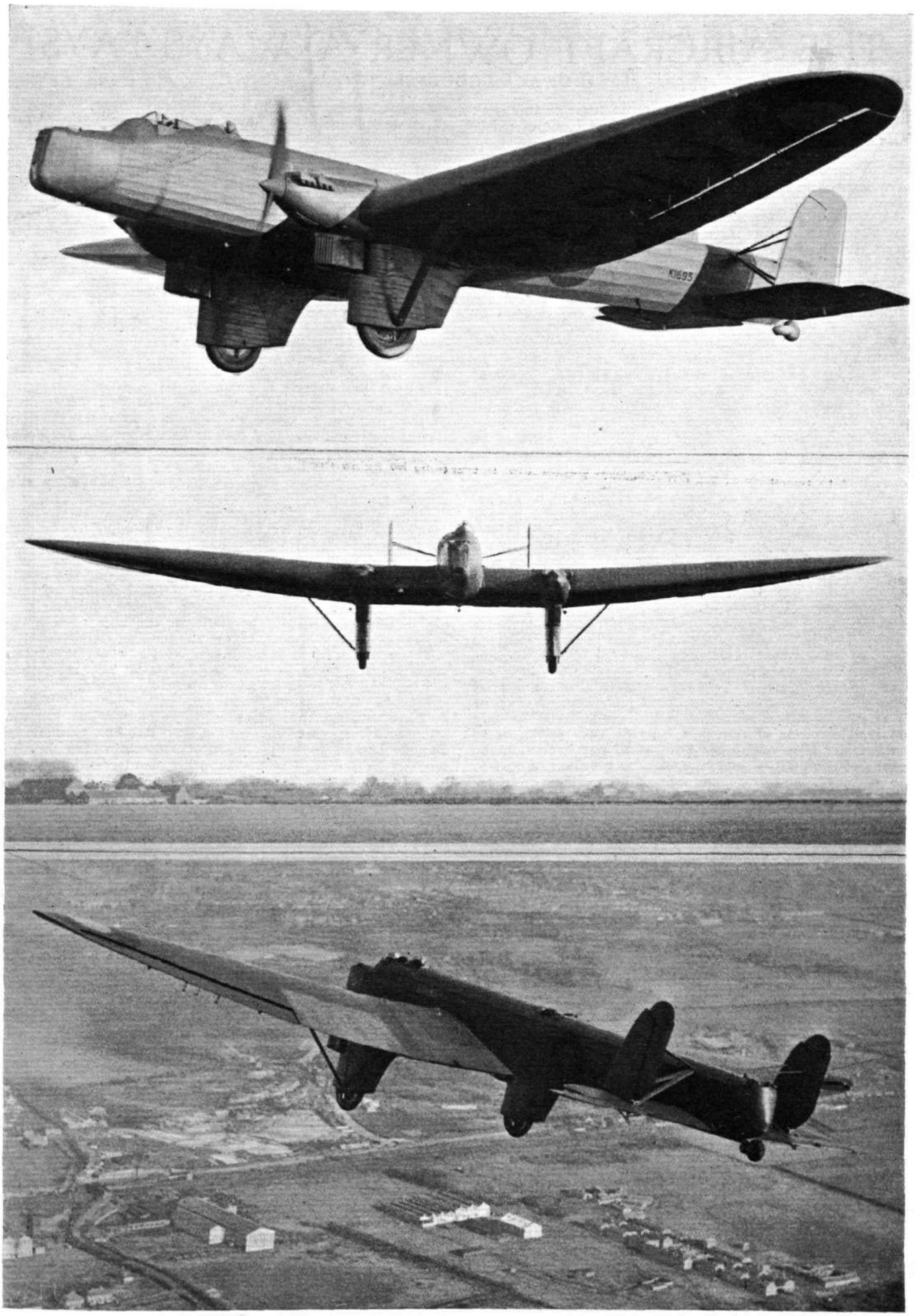
One of the most interesting features of Soviet Russia is the Red Air Force. It is, like the Air Forces of Great Britain and Italy, separate from the Red Army, but it is under the control of the Commissar for War. So too, and this is a very important point, is all civil flying. Friends of the Soviet may retort that in Great Britain military and civil flying are under the same Air Ministry. There the resemblance ceases. Mr. White remarks: "The Soviet leaders fully appreciate the value in time of war of civil planes fitted with bomb sights and racks, and they have been careful to see that civil aviation has developed in accordance with the basic principles of military strategy." The paper *Red Star*, the official organ of the Revolutionary Military Council, has written: "Military and civil aviation are very closely connected, and this connection must be strengthened." Which, we wonder, does the Disarmament Conference accept as the genuine sentiment of Red Russia—the proposals of Litvinoff or the statement of the *Red Star*?"

A recent League of Nations estimate puts the total of military aeroplanes in the Red Air Force at not less than 1,500, which Mr. White considers a fairly accurate or conservative figure. He says that the tactical unit consists of from six to 12 machines; three of these units make a squadron, and two to three squadrons a brigade. About 75 to 80 per cent. are reconnaissance machines, about 15 per cent. are fighters, and the remainder bombers. He concludes that Russia is weak in bombers, but perhaps he means twin-engined bombers. We must remember that reconnaissance machines can be used for day bombing. In Belgium, for example, the "Fox" is the equipment of reconnaissance squadrons. In addition to the above there are about 50 seaplanes with the Baltic Fleet and 25 seaplanes with the Black Sea Fleet. The building of semi-rigid airships is also in hand, and General Nobile has gone to Russia to design them. He is certainly a very good designer, though he has not shown himself a successful airship captain.

Russia is making great efforts to be independent of foreign aircraft factories. Before the war Russia, with M. Sikorsky and others as designers, was making a promising start with an aircraft industry. In the year 1916 Russian factories, according to figures quoted by Mr. White, turned out over 1,700 aeroplanes and 666 aero engines. By 1922 this industry had reached vanishing point, and the Bolsheviks had to start from the beginning to build it up. They bought large numbers of foreign machines (we remember a reported offer to buy British Schneider racers) and the Junkers firm helped them immensely by setting up works at Fili, near Moscow. The Junkers company has now closed these down, but the Russian Government has taken them over. Progress was slow at first. Flying training schools were opened, but crashes were so frequent that whole classes of students refused to fly the machines and had to be discharged. Now things are going much better, though it appears that design is largely a matter of copying foreign models. We must suppose that, unless the Five-Year Plan breaks down altogether, Russia will continue to make further progress in the air. Her web of long air lines is already sufficiently imposing.

As we have stated more than once before, we are not particularly impressed with the potentialities of air liners converted to bombing purposes and flown by untrained crews. Good fighter squadrons would find them so much cold meat. What is alarming about the Russian preparations is the attention which is being paid to chemical warfare. The Red leaders are certainly prepared to make full use of gas on any enemies whom they may encounter in the cause of World Revolution. Again, their efforts to date may be largely nullified by inefficient working, but the will to gas is certainly active.

Mr. White is positive that Russia does not want war yet. She wants to make more progress before she engages in an armed attack on Capitalism. This is obviously only common sense, and the Red leaders are not devoid of that quality. But they never for one moment relax their efforts to arouse in the whole population the spirit of militarism, and they constantly bid them prepare for the day when they shall lead the proletariats of the world against Capitalism. For Geneva to talk to such people of disarmament and universal peace is much like holding out an olive branch to a man-eating tiger. Yet, if Russia will not genuinely disarm, how can any other Power even think of doing so? The massing of aerodromes and warlike factories near the borders of Afghanistan should certainly be a warning to India which Great Britain would be foolish to overlook.



BREAKING NEW GROUND: In the design of the new Fairey night bomber (two Rolls-Royce "Kestrel") every effort has been made to achieve aerodynamic efficiency, and for the first time in the history of British aviation a night bomber has been produced as a cantilever monoplane. The size of the machine may be gauged from that of the visible crew. When these photographs were taken the machine was piloted by Flt. Lt. Staniland, Fairey's Chief Test Pilot. (FLIGHT *Photos.*)

THE AIRCRAFT OWNER ALWAYS PAYS

By ALAN GOODFELLOW*

ONE may safely say that no other form of transport has come so near to being mothered out of existence as air transport. Boats and carts were in existence when lawyers were few and far between, and in consequence the laws of land and sea transport have grown up gradually alongside the industries themselves.

In 1919, however, when the problem of framing Air Navigation Laws was first tackled in any serious way, there were hosts of international lawyers ready to join in the fun. Unfortunately, few of them seem to have had any knowledge of flying and many of them contemplated the aeroplane as something in the nature of a particularly dangerous wild beast for which they were called upon to construct a sort of legal cage!

The International Convention of 1919 was followed and supplemented by the Warsaw Convention of 1929, to which in turn is being added the Third Party Convention, though neither of these last two are yet in force. Both of them, however, may be expected to pass into law, and in both the same tendency is shown to regard the aeroplane as something against which the public, whether as passengers, consignors of goods, or third parties, must be protected. The fact that the first two classes are not compelled to travel or to send their goods by air does not seem to have occurred to the framers of the Conventions. Nor does it matter apparently that passengers and consignors can insure themselves and their goods when travelling by air. True, some limitation of liability has been or is to be granted to air carriers, but the general tendency nevertheless has been to emphasise their liability, to prevent them from contracting out of such liability wherever possible, and even to make them guarantee the extent of their liability by compulsory insurance. So far as the carriage of passengers and goods is concerned, the effect of these regulations may not be felt as a serious handicap for some time to come. The cost of aerial transport is high in any case, and where it is a commercial proposition it has become so, not so much as a competitor to existing forms of transport, but because it is the only practicable means of transport between two points, or so much faster than any other form as to put it outside the realms of competition and to make the question of cost to the passenger and consignor one of secondary consideration. In circumstances such as these the extra cost occasioned by compulsory liability and compulsory insurance is not sufficiently serious to handicap the development of air transport, although it may become so as time goes on. In any case, the Warsaw Convention affects in the main only the big international air carriers, who may well prefer the certainty of a fixed and limited liability to the uncertainty which has existed in the past.

The question of third party liability, however, brings the matter much nearer home, because it attacks not merely the big air transport companies, but every owner of an aircraft. Aircraft owners are in the unique position of being compulsorily liable for third party damage in all countries which have adopted the Convention of 1919. The new Convention reaffirms that principle, but proposes to limit the liability to £40,000, or the value of the aircraft, whichever may be the greater amount, except in case of negligence, when the liability will remain unlimited as at present. Furthermore, the Convention proposes that all aircraft owners shall be bound to cover this liability by insurance, deposit, or other form of guarantee.

A logical reason for the apparently anomalous position of the aircraft owner is not far to seek. According to an old principle of law, the owner of a plot of land has rights not only in the surface, but also in the atmosphere directly above his land. In other words, he can prevent any aircraft from flying over his property as being a trespass. This right was abrogated by the Convention of 1919, and presumably by way of compensation to the landowner, the aircraft owner was made absolutely liable for any damage caused by his aircraft, by persons therein, or by articles falling therefrom, whilst the aircraft was in flight, taking off or landing.

There is considerable legal justification for this; the proof of negligence against the pilot or owner of the aircraft might be an extremely difficult matter and, furthermore, if the right of damages were dependent upon negligence, it would (in certain cases) be extinguished by the death of the party responsible, which might very easily occur in the accident which caused the damage. While, therefore, it may seem to be rather hard upon the owner of an aeroplane that he alone, as distinct from the owner of any other type of vehicle, should be liable to third parties irrespective of negligence, there is at any rate some legal justification for it when the damage is caused by his flight over property belonging to the injured third party and which is not specifically dedicated to aeronautical purposes. (*Note.*—Another explanation suggests itself. At Common Law a man is responsible for damage caused by his "omission to do something which a prudent and reasonable man would do, or doing something which a prudent and reasonable man would not do." Possibly the jurists considered that the very fact of owning or operating an aircraft was evidence of "imprudence and unreasonableness"!) Some fault may well be found with the fact that such liability is unlimited or that the new proposals fix the limit at such a high figure as £40,000 and insist upon compulsory insurance in this sum. It cannot be said that the aircraft is incapable of causing damage to this extent, but it can truthfully be said that the records of the past twenty years go to show that the possibility is reasonably remote, and has in fact never yet materialised. Justice to both sides, therefore, could probably be done by fixing the limit at a very much lower sum, except in case of negligence, when, of course, the liability would remain unlimited.

It is interesting in this connection to note that in Germany, the first country to adopt the principle of compulsory insurance of third party liability, the limits have been fixed at Mks. 25,000 per person and Mks. 75,000 any one accident, while in the case of damage to goods the maximum liability is only Mks. 5,000. These limits are, of course, far and away below those proposed by the new Convention and whilst the limit in the case of damage to property may appear to be too low the fact that the law has remained in force unaltered for a period of ten years may be taken as some indication, at any rate, that the law has not been found to operate unfairly.

A more serious point, however, which seems completely to have escaped the notice of those responsible for the Convention, is that this compulsory liability extends to damage caused to property or persons anywhere on the land or on the high seas. In other words, although the aircraft owner has a perfect right to fly over and land upon an aerodrome he is automatically liable for any damage he may cause by doing so as though he had been guilty of wilful negligence. Here is an anomaly if you like! The airport owner, although he has established his aerodrome for the specific purpose of providing a landing ground for aircraft and the deriving of commercial benefit therefrom, is automatically protected against any damage that may be caused to his property by aircraft owners using the aerodrome. The only defence which the luckless aircraft owner can set up is that of contributory negligence.

Again, a flying-boat manœuvring on the surface of the water will be automatically liable for any collision which may be involved notwithstanding the fact that it has just as much right to manœuvre on the surface of the water as any other kind of boat and is committing no trespass when it flies over the high sea.

The point was apparently overlooked when the Convention of 1919 was drafted, but that is no reason why the mistake should be perpetuated in the new Convention. We must accept as reasonable the safeguarding of the rights of ordinary property owners above whose property we are permitted to fly, though we may fight for a reasonable limit to our liability. There is no reason whatever why we should have imposed upon us a compulsory liability when no question of trespass arises, that is to say, when we are flying over our own property, or an aerodrome where we are entitled to land, or over non-private water. In any such case the liability should be dependent upon negligence, as in the case of any other form of transport; it is illogical and unfair that it should be otherwise.

This principle has already been recognised by Denmark and Sweden so far as damage caused within the boundaries of a licensed aerodrome is concerned. It is high time that other countries recognised the principle and adopted the legal attitude that liability must be dependent upon negligence, except when it is caused by something which would, but for the terms of the Convention, constitute a trespass.

* *This article represents Mr. Goodfellow's personal views only.*

MR. LOWE-WYLDE'S "BABIES"

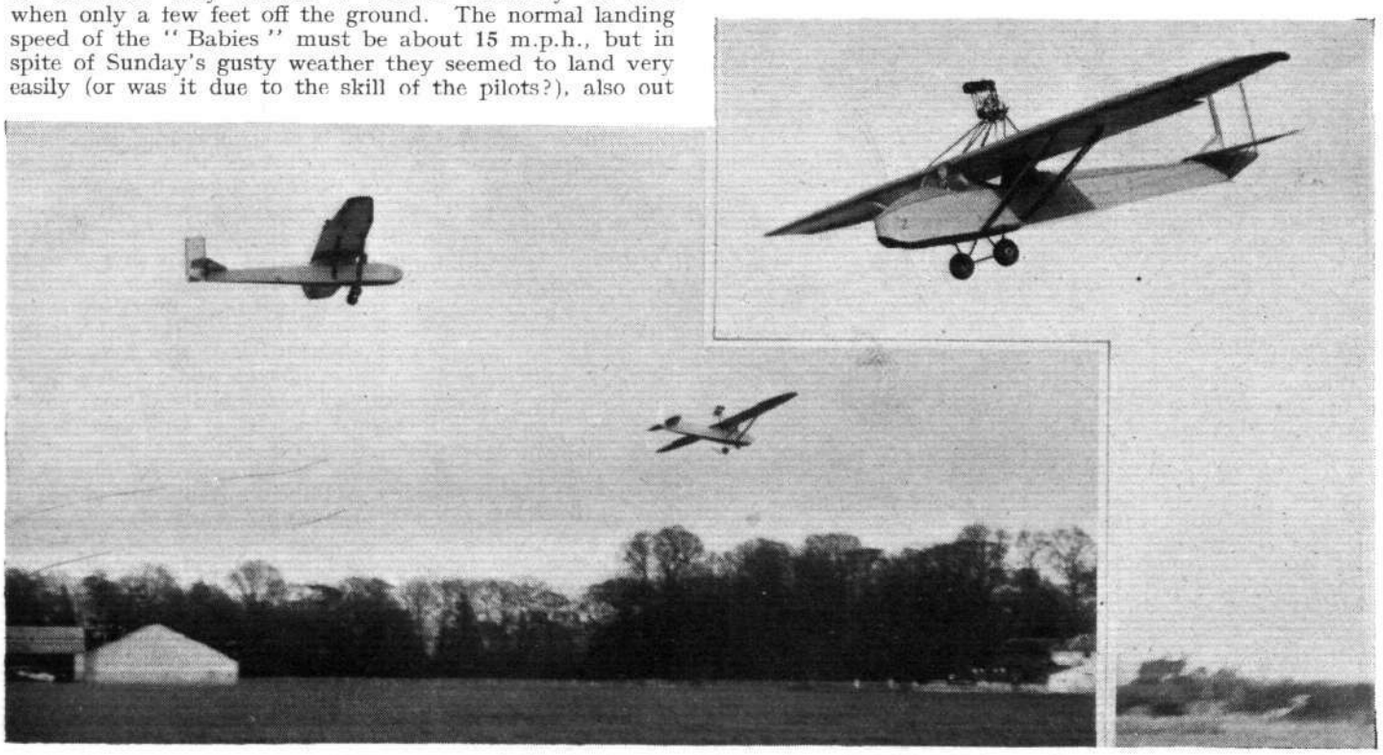
The first B.A.C. VII with an Engine of only 14 B.H.P. makes its first bow—and a most successful one—in public

ON the afternoon of Sunday, November 27, at Hanworth, Mr. Lowe-Wylde demonstrated his "Baby" aeroplanes before a gathering which, considering the state of the weather, was surprisingly large. Among the many interested spectators were the Master of Sempill, Lt. Col. J. T. C. Moore-Brabazon, Lt. Col. F. C. Shelmerdine, Air Com. F. E. Guest, Mr. E. C. Gordon England and A.M. Sir Geoffrey Salmond, who, incidentally, had a short flight in an autogiro. Mr. Lowe-Wylde's "B.A.C. VII" glider is, of course, well known, and has been mentioned in FLIGHT many times in the past. His "Baby" aeroplane is this same glider powered with a horizontally opposed flat twin "Douglas" motor-cycle engine of 600 c.c. (14 b.h.p.) mounted on a metal-tube structure above the wing, giving the machine an air speed of about 40 m.p.h.

On Sunday afternoon, in the capable hands of Mr. Lowe-Wylde and Capt. E. D. Ayre, two of these interesting machines gave unquestionable proof of their airworthiness, in spite of the rain and wind, which at times was blowing in quite strong gusts. It was noticeable that a "Moth," which was flying at the same time, seemed to be more affected by the bumps than did the "Babies." Mr. Lowe-Wylde was content to parade his machine round the aerodrome, but Capt. Ayre was more skittish, and, although he did not put his machine "through a series of hair-raising manœuvres" as was reported in one daily paper, yet he certainly did treat the spectators to a very pretty display of crazy flying, which demonstrated quite clearly the manœuvrability of this type of aircraft. From the ground it certainly looked as though the machine answered easily and quickly to the controls. The two pilots also flew in formation, but, again, Capt. Ayre was more interested in making sudden little dives at the ground, after the manner of a seagull fishing for its supper, than he was in seriously attempting to keep formation.

While the "Babies" were showing off their paces, two autogiros were also flying round, no doubt a little jealous and, perhaps, even a little nervous for their reputation, but, nevertheless, providing an excellent comparison. Mr. Lowe-Wylde's machines left the ground in half the distance taken by the autogiros, and although they did not quite sit still on touching the ground like their weird wingless sisters, still they only ran a very few yards, but it must be admitted they showed a distinct tendency to float when only a few feet off the ground. The normal landing speed of the "Babies" must be about 15 m.p.h., but in spite of Sunday's gusty weather they seemed to land very easily (or was it due to the skill of the pilots?), also out of half-a-dozen landings which each pilot made there was never a sign of a single little bounce; neither did the

BABY TALK: From left to right, Capt. E. D. Ayre, the Master of Sempill, Mr. Lowe-Wylde, and Mr. Gordon England. (FLIGHT *Photo.*)



THE "AIR BABIES" IN FLIGHT: On the left, the two "in formation," and on the right Capt. Ayre in the air. (FLIGHT *Photos.*)

STARTING UP : By pulling a wire wound round a drum behind the engine. (FLIGHT *Photo.*)

machines show the slightest tendency to be blown over, while on the ground, by the windy gusts.

Mr. Lowe-Wylde claims that his machines possess a very small angle of glide, which he was unfortunately unable to demonstrate on Sunday owing to the wind necessitating the use of the engine while landing. Also he states that they do not stall easily, and that their behaviour after doing so is in no way alarming. This little aeroplane is, of course, only in an experimental stage, and will no doubt be vastly improved. The engine mounting, for instance, is crude and the petrol tank unnecessarily exposed. We understand that an entirely different design is the ultimate object of these experiments.

THE POWER UNIT : A close-up showing the little Douglas on its mounting and the petrol tank above it. (FLIGHT *Photo.*)

So much for the machines themselves ; now a word about their utility and possibilities. One gentleman, well known in aeronautical circles, was heard to remark that these "Baby" machines were only toys and could serve no useful purpose. That, of course, is far from being a fair criticism, and in any case one might remind this critic that the invention of steam-powered engines owes its origin to a boy toying with a kettle ; whilst there is a popular story that the man who first made experiments with electricity had his curiosity aroused while flying a kite in a thunderstorm. Actually these "Baby" aeroplanes bear the same comparison to what the same critic called "real aeroplanes," as the small yacht or speedboat does to a liner, or as the "Baby" car does to a larger motor vehicle, and no one would accuse either a speedboat or a Morris Minor of being devoid of utility. One very good use to which these little aeroplanes could be put is for instructional purposes. The first thing that a would-be pilot has to learn is to acquire an "air sense," which is not generally developed until several hours' solo have been done ; and the dangerous period in a pupil's training is when he or she is acquiring this "air sense." This could be acquired as easily on Mr. Lowe-Wylde's machines as on light aeroplanes more highly powered and in a shorter time. The advantages of such a "Baby" machine so used are twofold ; firstly cheapness, and secondly safety. Mr. Lowe-Wylde's "Babies" could probably be marketed at about £150 if the demand was great enough, and the cost of upkeep and running would be ridiculously small—one and a-half hours' flying on one gallon of petrol! As regards safety, it is a known fact that a large proportion of flying accidents occur either when the machine is landing or when it is gliding in to land. Mr. Lowe-Wylde's "Babies" could be glided in at a very slow speed and manœuvred in a most outrageous way without danger being caused to the pilot. As for piling them up landing—well, the difficulty would be to do it rather than to avoid doing it.

In conclusion, though these machines are only "Babies," still even babies grow up, and if properly nurtured become useful members of the community. Also, Mr. Lowe-Wylde can be doing no harm to aviation by his experiment, and "those that are not against us are for us." It rests very largely, as we have many times pointed out, with getting a suitable engine, and if the two Douglas aircraft engines, now being built, turn out successful, then this problem should largely be solved.

FROM THE CLUBS

LONDON AEROPLANE CLUB

The London Aeroplane Club are now settling down to their winter routine, and last week three members, Miss O'Connell and Messrs. Biedermann and Willems, completed their "A" licence tests. At the end of the week, in most unpleasant weather and a "Puss Moth," the notable Miss Lippens arrived complete with haversacks. She claimed to have left Brussels with full tanks and only required two gallons to top up when arriving in England. She must have soared all the way along the Downs.

A CHRISTMAS GLIDING COURSE

The London Gliding Club have been able to secure the services of Herr Wolf Hirth for a period of ten days or so, starting from Boxing Day. Over a dozen machines will be available, and arrangements have been made with this well-known instructor to run courses consisting of two days or more during this period. This is a unique opportunity and one which we feel will undoubtedly prove of great interest, not only to members of the London Gliding Club, but also to others who are now realising the value which is to be obtained from Motorless Flight. The London Gliding Club has already done more than any other body to establish gliding and soaring on a sound basis in this country, and their camp at Dunstable is a veritable hive of industry every week-end.

GRAVESEND AVIATION, LTD.

Gravesend Aviation, Ltd., has been going steadily ahead since its inauguration, and over seven new members were enrolled last week. The buildings on the aerodrome are going up apace, and largely due to the energies of the new managing director, Mr. H. Gooding, who is one of Gravesend's biggest builders, the hangars are almost completed. K.L.M. recently sent down a machine to survey the aerodrome as an emergency landing ground for their use. We understand that their London manager expressed himself as very satisfied with the facilities afforded, which include Customs and police, both available at 5 min. notice, and a bus to take passengers to London, a journey of one hour. The Club's chief instructor, Mr. A. D. Carroll, who is responsible for the organisation generally, the flying and the aerodrome management, besides the onerous secretarial duties always associated with a new venture of this kind, has now passed out his first pupil, Mr. L. H. Fletcher, who secured his "A" licence on November 14.

NATIONAL FLYING SERVICES, HANWORTH

Pursuing the plan of descending on various other aerodromes for lunch visits at week-ends, seven Hanworth machines and five from Brooklands flew to Hatfield from Hanworth on Sunday the 20th. High winds and bad visibility spoilt general flying throughout the week, but the instructors took the opportunity of giving dual instruction to many members to accustom them to flying in rough weather

Night flying took place on Wednesday, and after the local flying Mr. A. Reid successfully carried out his night-flying test for his "B" licence, flying from Croydon to Lympne.

The "Kidnapping Party" organised by the Committee was a tremendous success. Flt. Lt. Allen as the bold bandit, and Miss Mealing as the kidnapped maiden, vanished before the eyes of the crowd, who started in pursuit. Their search led them ultimately to the discovery and rescue of the distressed damsel in the clubhouse, where the affair was "satisfactorily settled," and ended with picnic tea on the floor!

Distinguished visitors by air last week included Miss S. Lippens, Miss Paddy Naismith, Mr. Hall Caine, Lady Nelson, and the two Spanish officers, Capt. Rodriguez and Capt. Paso, who are in this country to collect the Cierva "C.19" which has been sold to the Spanish Government.

BROOKLANDS AERODROME

Regular pupils during the past week have included Messrs. Opie, Midgley, Thompson, Smith, Marshall, Wood, and Bond, all of whom have done a considerable amount of flying. A new pupil is Mr. Chizik, who has just commenced instruction. Sir Anthony Lindsay-Hogg has been having some advanced dual instruction. The staff have also been active, Messrs. Barr and Massey having flown to Hamble; Mr. Barr also made a trip to Reading.

On Sunday a party of private owners went over to Hatfield, and had an eventful time, the fog proving so thick that several had to "put down" at Northolt Aerodrome and return by car.

Col. Smith-Barry—who was one of the pioneers of scientific flying instruction—came to Brooklands on Thursday, and after a stay was flown away in his "Puss Moth" by Mr. Van Marken. Mr. Van Marken then returned in the machine, which went into the Brooklands workshops for overhaul.

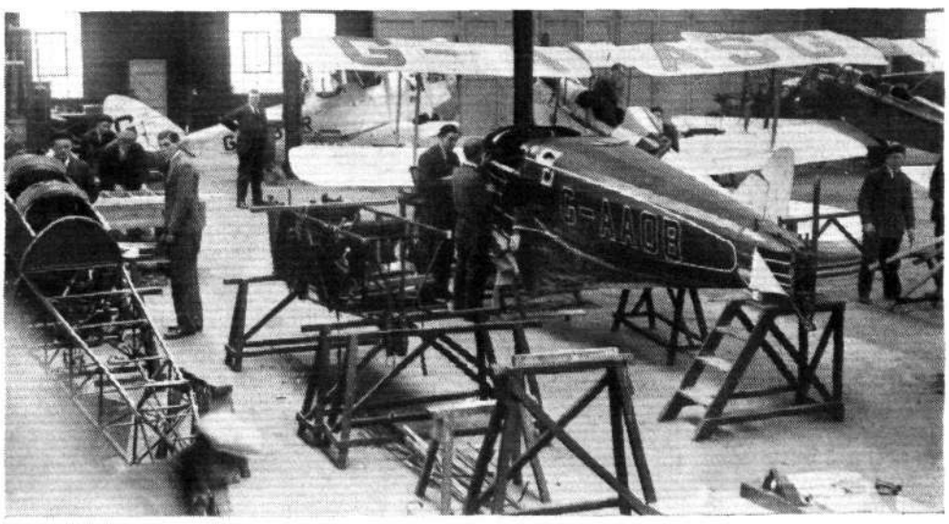
One difficulty which has in the past beset airmen has been that of hiring a machine for short periods. One does not always want to buy a machine, and it is possible to get a great deal of enjoyment by hiring a machine as and when it is wanted—the only drawback being that school and club machines are often in demand for instruction, and can only be hired for an hour or so.

Arrangements have been made at Brooklands for anyone who has a pilot's certificate to hire at short notice a "Gipsy Moth" with slots, navigation lights, and compass, for any period. The rates have been kept as low as possible, and there is already considerable demand for this service. It's use is not confined to members of Brooklands.

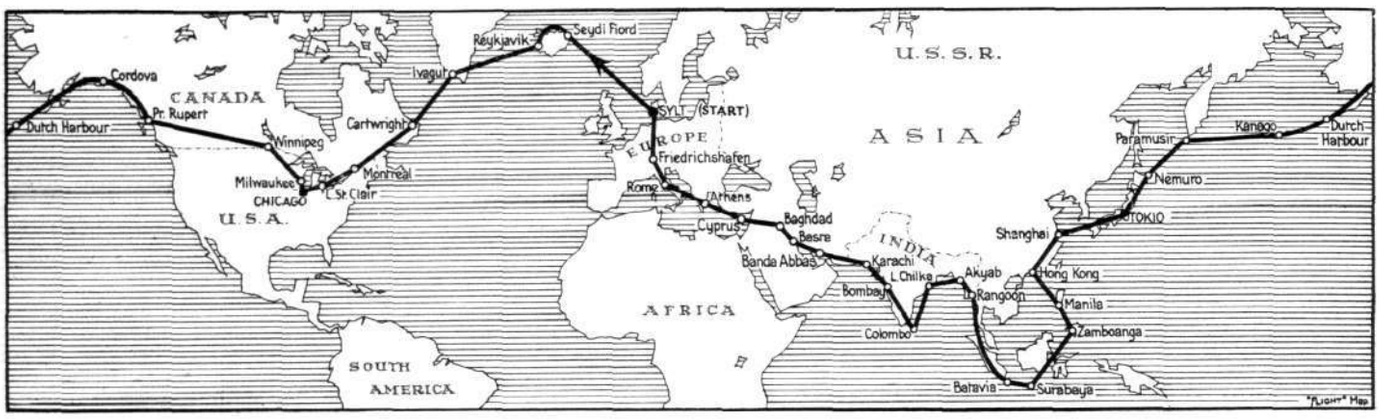
Mr. John Grierson has had "Rouge et Noir," his veteran machine which has done many thousands of miles, overhauled and repainted, and it now looks very spick and span. A few more names, representing the flight to Moscow which he has just completed, have been added to the already crowded surface.

Mr. Young has been flying a good deal in his own "Moth." He comes down to Brooklands nearly every day, and is able to stroll out and fly whenever he feels inclined, for his home is only a few minutes' walk from the aerodrome.

The new College building is now well under way, and considerable improvement is noticeable since last week. As soon as the workmen have finished, the first batch of students will be taking over.



FOR REPAIR AND MAINTENANCE : The well-equipped workshops at Hanworth (now under the charge of Capt. E. D. Ayre) have been increasingly busy lately overhauling aircraft for C's. of A. and on general repair work. (FLIGHT *Photo.*)



VON GRONAU'S WORLD FLIGHT

VON GRONAU'S flight round the world in the Dornier flying boat *Grönlandwal*, D. 2053 (two "B.M.W. VII" engines), was so planned as to be made with the minimum of outside assistance, and everything possible was done to make the machine self-sufficient except in the matter of fuel supplies.

The actual machine used was the one on which von Gronau crossed the Atlantic in 1931. In addition to von Gronau the machine carried Gert von Roth as second pilot, Fritz Albrecht as wireless operator and Franz Hack as engineer.

At the start from the Island of Sylt at 11 a.m. on July 22, the machine was very heavily loaded with fuel for the non-stop flight to Iceland (1,120 miles). After a flight of more than eight hours' duration von Gronau landed in Seydisfjord, on the east coast of Iceland, at 7.50.

The next day a start was made at 11.55, and flying round the northern coast of Iceland the machine landed at Reykjavik at 3.5.

On July 25, at 10.30 a.m., a start was made from Reykjavik, and Ivagut, on the south-west coast of Greenland, was reached towards 7 p.m. With previous experience of the difficulty of flying across Greenland, von Gronau decided again this year to fly round the southern end. Starting from Ivagut at 12.25 (Mean European Time), Cartwright, on the coast of Labrador, was reached at 10.45 p.m. (G.M.T.). A ground mist made it necessary to land by the aid of radio instructions after the machine had circled over Cartwright for nearly three hours.

Leaving Cartwright at 6.50 p.m. (Eastern Standard Time) on July 26, Montreal was reached at 8.6 p.m. on July 27. An intermediate landing was made on the way to St. Clair Lake, when the engines were given a slight overhaul. In the meantime the crew were the guests of Mr. Henry Ford.

Chicago was reached on August 2, and the flight was continued on August 6 to Milwaukee, where the crew were given an enthusiastic reception.

During the period August 11 to 23 the overland flight from Milwaukee to Winnipeg and Prince Rupert was made, entailing the crossing of the Rocky Mountains at an altitude of more than 10,000 ft.

The flight from Prince Rupert to Cordova was made on August 23, and on August 26 von Gronau started the 900-mile flight to Dutch Harbour, where the Dornier arrived at 8.30 p.m. Pacific Time.

On August 31, the machine reached Kanago Harbour, in the Andeanowski Islands, and on September 2 the flight was continued from Kanago Harbour to Kakumabetsu Bay in the Paramushiro Islands, the northernmost of the Japanese Kurile Islands. The flying boat crossed the Behring Strait in 7 hr. and landed towards 4 a.m.

A start for the next stop at Nemuro on Hokkaido was made on September 3 at 4.55 a.m. Tokio time, and the machine arrived at 10.52. An early start was made next day and Tokio was reached at 11 a.m., where huge crowds had collected to greet the *Grönlandwal*.

Von Gronau's next destination was Nagoya, for which he started on September 16, arriving at 5 p.m. While taking off again the left wing of the flying boat was slightly damaged, but the crew were able to effect repairs, and on September 21 the flight was continued to Kagoshima.

At 8.50 a.m. on September 22 von Gronau left Japan, and on the same day at 1.10 p.m. he alighted at Shanghai.

The flight from Shanghai to Hong Kong was made on September 25. Manila was reached on September 27 after a flight of 6½ hr.

At 8 a.m. on September 30 the flying boat started for Zamboanga, on the Philippine Island Mindanao, and the multitude of islands in the Malayan Archipelago were successfully negotiated, and Batavia reached on October 6. On an average the machine covered while flying this stretch some 600 to 700 miles per day. In Batavia von Gronau succeeded for the first time in getting into direct wireless communication with Berlin over a distance of 9,300 miles.

A start was made from Batavia on October 8. The intention had been to make an intermediate landing at Port Swettenham before continuing the flight to Akyab. Although weather conditions were good at the start, the wind soon got up and kicked up a nasty sea. When some 150 miles from the coast of Burma, in the region of the Mergui Archipelago, a water pump developed trouble, and von Gronau was faced with the problem of making a forced alighting, as the heavily loaded machine was not able to keep in the air on one engine. While Hack, the engineer, took the skin off his shins in an effort to get to the defective engine, and while Albrecht sent out an S.O.S. to Manila, von Gronau struggled to keep the machine in the air until the three tallest waves should have passed under him. Then, in a breathing space before the next set of high waves should approach, von Gronau succeeded in getting the machine down safely. The troubles of the *Grönlandwal* were not yet over, however. The coast of Burma was a long way off and the only hope was to get in touch with a steamer. These, however, have only long-wave wireless, and the Dornier had to erect a mast and stretch an aerial to the wing tips. After several hours' work, in constant danger of being washed overboard, an aerial was at last erected. The steamer *Caragola* heard the S.O.S., changed its course and shortly arrived on the scene. By the exercise of excellent seamanship the *Caragola* succeeded in taking the *Grönlandwal* in tow.

After towing for about 200 miles, the *Caragola* brought the flying boat into Rangoon about midnight on October 11. After 70 hours of uninterrupted hard work the crew were at last able to get thoroughly rested. It deserves to be placed on record that the owners of the *Caragola* refused any remuneration for the help which they had given the flying boat.

Spares having been obtained, and the damage repaired, the "Wal" flew to Akyab on October 17, and on October 18 Chilka Lake was reached, where the crew were the guests of the Rajah of Collecot.

Colombo was reached on October 20, and by October 26 they arrived at Bombay, where a day of rest became imperative, as Roth was taken ill with fever.

On October 27 the flight was continued to Karachi, where again the machine got into direct wireless communication with Germany.

On October 30 the flight was continued to Baghdad, with stops at Banda Abbas and Basra.

Cyprus was reached on November 1, and after another flight of nearly 600 miles Athens was reached on November 2. On November 4 the machine alighted at Rome, and on November 7 the flight was continued to Genoa, where the *Grönlandwal* arrived at 1 p.m.

Unfavourable weather conditions over the Alps caused von Gronau to postpone his start for Friedrichshafen, where he ultimately arrived safely on November 9.

AIRISMS FROM THE FOUR WINDS

Mr. Smith's Flight

MR. VICTOR SMITH, the 19-year-old South African airman, who left Capetown on November 13, arrived at Croydon on the evening of November 24. Mr. Smith's flight may not have been record breaking, but it was not without interest and excitement. After he had left the Niger River to fly by compass to Gao, Mr. Smith suddenly found that a petrol feed pipe was leaking, and instead of having about 25 gall. he only had left sufficient fuel for about 10 min. flying. He force-landed near a pool of water and received hospitality, such as it was, from members of the Tuareg tribe. After three days, native French soldiers arrived with food and 16 gall. of petrol, which enabled Mr. Smith to fly on to Dori, where he spent two days getting repairs done, these finished he flew on across the Sahara. Throughout the flight he used K.L.G. plugs, which caused him no trouble whatsoever. Mr. Smith has intimated that he may attempt to beat Mrs. Mollison's record for the England-Cape flight.

Girl Cape Flyers.

MISS JOAN PAGE and Miss Audrey Sale-Barker, who left Heston on October 27 to fly to the Cape in a "Moth," are reported to have reached Malakal, in Southern Sudan. They experienced several delays on their journey.

Future Ventures into the Stratosphere

PROF. PICCARD has expressed a conviction that the moon will be reached from the earth within the next two years, but admits that the return journey might be impossible, which minimises both the attractiveness and possible utility of such a venture. The Professor adds that he himself will make no further attempts to investigate the stratosphere, but his colleague, Dr. Max Cosyns, will make two more ascents in the future, one simply to be a "world altitude" expedition, and the other, starting from Hudson Bay, will be undertaken for the purpose of studying the deviation of the cosmic rays in the region of the north magnetic Pole.

A Flying Governor

SIR STEWART SYMES, Governor of Tanganyika Territory, known locally as the "Flying Governor," completed recently by air a 2,000-mile safari in 31 days. The powers that be in Tanganyika have discovered, some little time back, that safari by air is far cheaper than by car, and have therefore equipped themselves with a small fleet of light aeroplanes.

Another Flying Governor

SIR HUBERT YOUNG, the new Governor of Nyasaland, with his wife and three children, flew by air mail to Salisbury, Southern Rhodesia, and thence to Nyasaland in "Puss Moths."

D.H.84 Flies

LAST week the first of the de Havilland 84 twin-engined machines was completed at the Stag Lane works sufficiently for Capt. H. Broad to make a short test flight on it. Although one of the engines was not running too well at the time (the trouble having since been remedied) the machine "leaped" off the ground after an incredibly short run. The 84, with "Gipsy Major" engines, promises to be one of the most economical aeroplanes ever produced, and should be somewhere very close to the paying-without-subsidy ideal which we have been hoping for.

Sir Geoffrey Salmond on Disarmament

AIR MARSHAL SIR GEOFFREY SALMOND, speaking at a dinner of the Comrades of the Royal Air Force Association on November 26, said that it was quite impossible to make war humane. The air forces were the greatest deterrent against war, as statesmen who contemplated war would know that they would lay their country open to terrible attacks from the enemy, who would immediately attack the Home Front. With this responsibility, would they be so likely to take on themselves the responsibility of making war? Anything which could shorten a war—and the air forces were the most powerful arm to do such a thing—should not be abolished.

Internationalising Civil Flying

THE Air Transport Committee of the International Chamber of Commerce met at Paris on November 25 and passed the following resolution:—"Without desiring to express any opinion on the political aspect of the question, and with full confidence in the sincere desire of Governments for peace and in their ability to find the means of ensuring it, the Air Transport Committee of the International Chamber of Commerce considers that the internationalisation of civil aviation would constitute a serious obstacle to the free development of commercial aviation and to the progress of international trade."

The Proposed One-Third Reduction

THE Under-Secretary for Air, Sir Philip Sassoon, in reply to a question in the House on November 24, stated that if the proposed one-third cut in British Air Forces were carried out the saving would not approach 33⅓ per cent. of the current Air Votes. The annual saving could not be given without undue time and labour, as it would be necessary to consider the distribution of the cut between Home Defence, the Fleet Air Arm, Army co-operation and overseas areas.

Bombing Practice in Lincolnshire

ON November 9 in the House of Commons, Sir P. Sassoon, Under-Secretary for Air, stated in reply to a question that a portion of the north end of the urban district of Mablethorpe would be included in the ground for bombing and machine-gun practice to be established on the Lincoln coast. He understood that only one house had been built in the district and a small bungalow was in course of construction. High-explosive bombs would be used about four miles away from Mablethorpe town and machine-gun fire about two miles away. He had no reason to fear that loss of trade or rateable value would result, and he added that a R.A.F. station should have a good effect on the prosperity of the district.

Sir William Morris

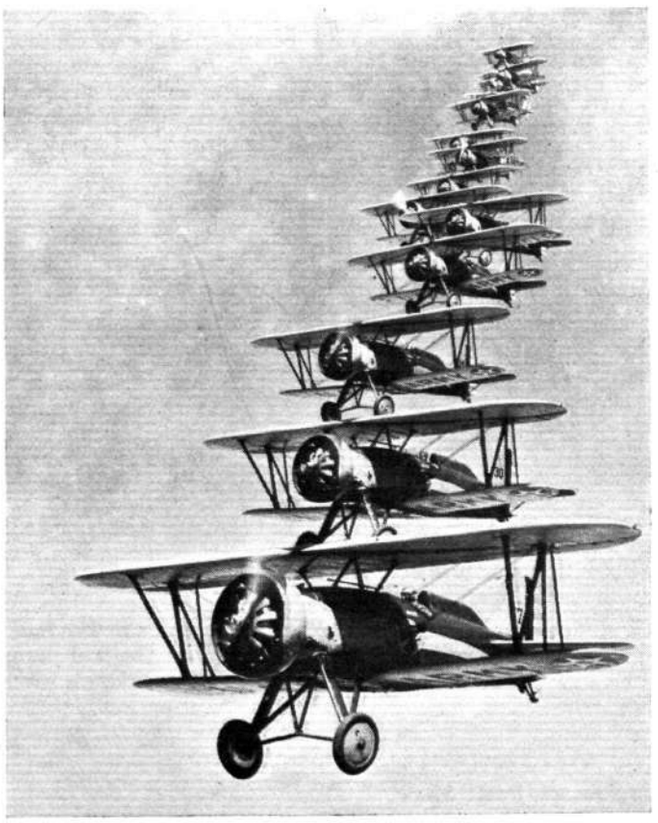
SIR WILLIAM MORRIS has presented £52,000 towards a new hospital centre for Birmingham, the site of which covers 150 acres and has been given by Cadbury Bros.

Barcelona a Zeppelin Port ?

DR. ECKENER, commander of the *Graf Zeppelin*, has concluded his visit to Spain, and has offered to make Barcelona a regular port of call for the airship on its voyages to and from South America, provided that a suitable mooring-mast is constructed.

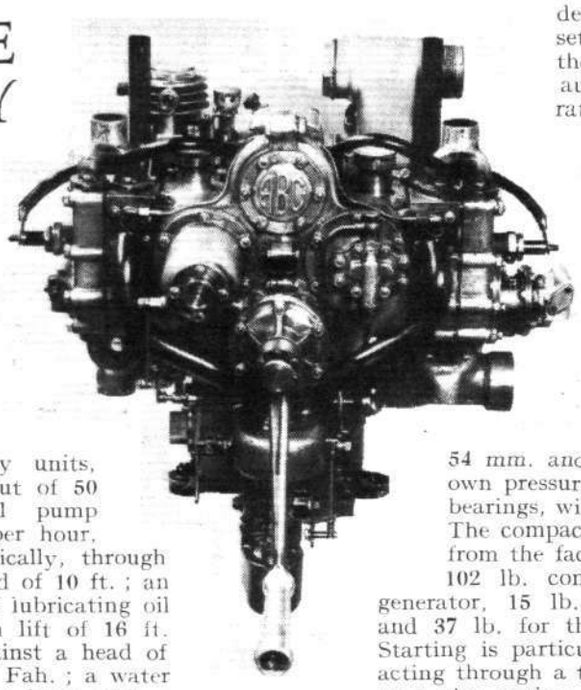
No. 314 Anti-Aircraft Searchlight Company, R.E.

THE Lord Lieut. of Kent, Lord Camden, on November 26 opened a new drill hall at Tonbridge as the headquarters of No. 314 Anti-Aircraft Searchlight Co., R.E., Territorial Army. Maj. Gen. H. F. Salt, commanding the Air Defence formations, was present and made an address.

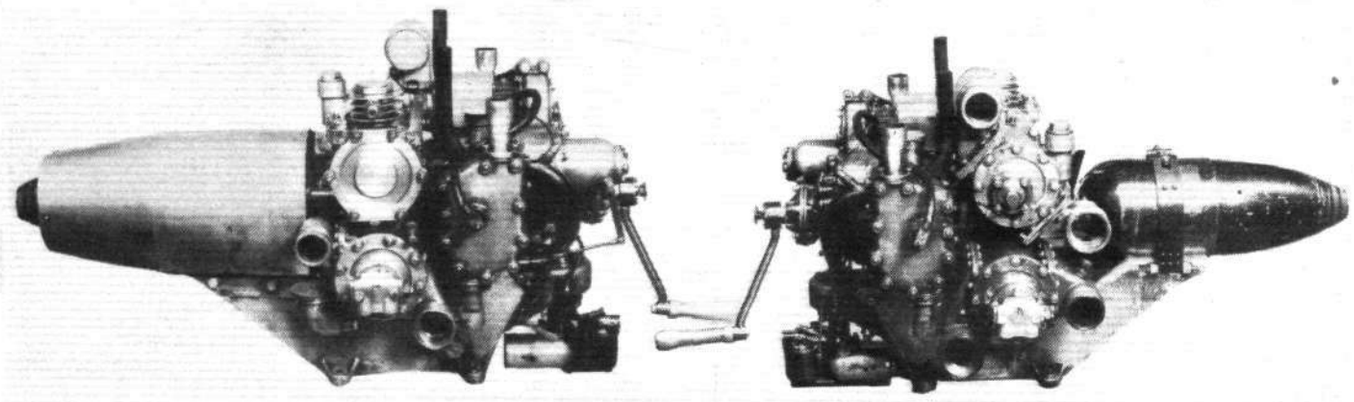


A STAIRCASE IN THE BLUE: Impressive photograph of a group of single-seater, Wasp-powered Boeing P-12E pursuit planes of the 27th Pursuit Squadron, U.S. Army Air Corps, Selfridge Field, Mich.

A UNIQUE AUXILIARY SET



ONE of the most interesting, small and useful auxiliary sets it has been our pleasure to see is that which has been designed by Lord Ridley and produced by A.B.C. Motors, Ltd., of Walton-on-Thames. It consists of a 4-h.p. two-cylinder horizontally opposed four-stroke engine which operates no less than five auxiliary units, namely, a dynamo with an output of 50 amps. at 12 volts, a petrol pump delivering 2,250 gallons of fuel per hour, with a suction lift of 16 ft. vertically, through a 1-in. flexible hose against a head of 10 ft. ; an oil pump delivering 300 gallons of lubricating oil per hour, with a vertical suction lift of 16 ft. through a 1½-in. flexible hose against a head of 2 ft. at a temperature of 60 deg. Fah. ; a water pump delivering 2,500 gallons per hour with a suction lift of 16 ft. ; and an air compressor which will charge an air bottle holding 400 cub. in. of air to a pressure of 200 lb. in 10 min. We imagine that this unit, which has been designed for Air Ministry use, will be installed not only in large flying boats, but also in large aircraft of all types. The engine, as we have already mentioned, is of the horizontally opposed type and particularly sweet running. This is probably largely due to the use of a three-throw crankshaft, which entirely avoids the rocking couple so prevalent in normally designed horizontally opposed engines. The engine is mounted on a bedplate, and connected to the rear side of it is a gear case which houses the clutch arrangement operating the various drives of the auxiliaries. As will be seen from the photographs, these are bolted on either side of this case and driven by spiral gears from the crankshaft. Looking from the front, or the starting handle end of the engine, the air compressor is situated above the left-hand cylinder behind the engine with the fuel pump immediately below it. On the opposite side of the engine opposed to these two units the oil pump is fitted in the upper position and the bilge pump in the lower position. The generator is bolted directly to the crankshaft extension, and is designed to act as a flywheel. The set is so arranged that by means of the clutch gear any of these five auxiliaries can be operated separately or together with the generator, that is, the generator under load and not merely acting as a flywheel. All the auxiliaries can be operated together if required, with the exception of the bilge pump, the working of which requires the whole output of the engine. The engine itself is a small high-speed one, developing 4 b.h.p. at 4,000 r.p.m. It is governor controlled, and uses a Zenith carburetter and B.T.H. magneto. The bore and stroke are 54 mm. and 38 mm. respectively. It has its own pressure feed oil circulating system to all bearings, with its oil supply carried in a sump. The compactness of this engine can be judged from the fact that the whole unit weighs only 102 lb. complete, including 23 lb. for the generator, 15 lb. for the bilge pump and drive and 37 lb. for the engine itself without bedplate. Starting is particularly easy by means of a handle acting through a train of epicyclic gears arranged to turn the engine at four times the speed of the handle. A Ki-gas priming pump is fitted, and the gears are automatically thrown out when the engine fires. As one may imagine from the study of the weights, light alloys have been used extensively in this interesting little design. The crankcase, cylinder heads, and all castings, except the bilge pump, are in R.R.50 (D.T.D.133), the latter being aluminium bronze. The pump blades are nitralloy steel and the cylinder liners are internally case-hardened and ground steel. The connecting rods are duralumin with white metal big ends. The crankshaft is of nickel chrome steel. All three pumps, which are of the eccentric and fan type, were especially designed in the works for use with this unit. The generator, of course, is the standard Air Ministry type and is enclosed in a cowling with a fan giving a 35-m.p.h. draught over it. It only requires 1¾ h.p. at 4,000 r.p.m. to drive it. The air compressor is also an Air Ministry standard fitting of the Herzmark type. The engine as at present arranged is water cooled and designed to be connected to the main engine cooling system, but a small circulating pump can be fitted if necessary. The complete unit has passed all the Air Ministry acceptance tests, during which it has run some 100 hours, with between 30 and 40 hours on the auxiliaries.



The view at the top of the page shows the starting-handle end of the A.B.C. Auxiliary Unit. On the left at the bottom can be seen the air compressor and the fuel pump, and on the right the oil and bilge pump. In these views the generator is shown cowled and uncowled.

Engines at Paris Show

PROBABLY greater progress was to be found among the aero engines than among the aeroplanes at the Paris Aero Show, and we have been fortunate to get a promise from Maj. G. P. Bulman, O.B.E., B.Sc., F.R.Ae.S., Assistant Director (Engines) of the Directorate of Technical Development, Air Ministry, to write for the benefit of FLIGHT readers an article describing his impressions of the progress in aero engine development evidenced by the new types exhibited in the Grand Palais. Maj. Bulman's article will be published in FLIGHT very shortly.

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

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CONTENTS

LIGHT AERO ENGINE-AIRSCREW COMBINATIONS

By W. R. Andrews, A.F.R.Ae.S.*

Since the Lympne competitions of 1923 and 1924, the super light aeroplane has died a natural death. Looking back at the difficult conditions under which the aeroplane designers laboured, it is remarkable that such good performances were obtained. The majority of the engines available, while excellent for motor cycles, were very inefficient as prime movers for aircraft.

In a few cases gearing was added and the performance was greatly increased—this merely showed what could be done. No one would suggest the continued use of ordinary unlubricated, unprotected motor cycle chain as an ideal reduction gear between engine and airscrew; yet this was used with marked success.

The unreliability of the engines was largely responsible for killing the type. For this the engines themselves cannot wholly be blamed as in many cases they were running at some 50 per cent. in excess of the maker's ratings. (Ref. 1.)

The lessons to be learnt from the Lympne competitions seem to some extent lost; at any rate, no one has tackled the really light engine problem seriously since that date.

The attitude of the engine manufacturers seems to have been that gearing, though helpful, was not invariably successful, and that the alternative was more power. And so powers were increased 60-80-100-120-150—until now the process is reversing. (Ref. 2.)

Shall we ever get back to the 30-h.p. engine in a single-seater which can be run for about 3s. an hour for fuel and oil?

From the evidence of these early experiments the conclusion was formed that it was not a practical possibility to fly a single-seater aeroplane with less than 60 h.p. There were tremendous difficulties in the way of the designers. The engines available were not designed for the work in hand. The nature of the problem made low airscrew efficiencies inevitable, and as a result the engines were run at higher than rated r.p.m. in an effort to reach the peak of the thrust h.p. curve.

The form of engine mounting was not originally intended for aircraft use, and the provision of a rigid mounting was no easy matter. The addition of extraneous gearing made fresh difficulties. The airscrew problem also caused a lot of trouble.

The following notes give some of the variations which influence the problems of this much maligned appendage.

The slope of the free air efficiency curve with small pitch ratios is very steep. Small variations in pitch will, therefore, have a marked effect on the free air efficiency. As, however, a change in pitch necessitates a change in airscrew diameter, the losses due to slipstream effect over the body are also changed.

As a result the determination of the point of maximum net efficiency would become a matter of experimental trial and error over a large range of $P_{f/D}$ ratios.

The thickness-chord ratio of these small pitch airscrews is also of great importance.

It is probable that a thin metal airscrew of suitable pitch would improve the performance, even though slightly heavier than a wooden one—providing the tip speed can be kept low enough.

As the $P_{f/D}$ ratio increases, the effect of thickness and small variation of $P_{f/D}$ ratio become less pronounced, until at a $P_{f/D}$ ratio of 1.0 there is comparatively little to choose between any practical airscrews. The airscrew which gives slightly the best speed will probably be found worse on climb, but provided the pitch of a wooden airscrew is within ±6 per cent. of the value of V/n at top speed, the performance will not be greatly affected. The thinner the airscrew blade the higher must be the face pitch to give the same aerodynamic properties.

It is not possible to generalise too far on what is the optimum engine-airscrew combination for different speeds, as the factors governing the results are too many but they are indicated as under:—

(*a*) V/nD at top speed as large as possible.

(*b*) $P_{f/D}$ ratio to be as high as possible. P_f should not vary more than about ±10 per cent. from the value of $\frac{V}{n}$ at top speed.

* Mr. Andrews is on the Technical Staff of A. V. Roe & Co. Ltd.

(*c*) Aspect ratio of the blades (that is the ratio of maximum blade width to diameter) to be as high as possible.
(*d*) Thickness of blades to be as small as possible.
(*e*) Body drag in the slipstream to be as low as possible.
(*f*) Ratio of body diameter to airscrew diameter to be as low as possible.
(*g*) Airscrew tip speed to be below 900 f.p.s. to reduce losses and noise.

All the above conditions are co-related. For instance, if one increases the P/D ratio it is necessary to reduce the diameter and consequently increase the ratio of body diameter to airscrew diameter; also greater losses occur due to the increased slipstream speed.

To illustrate the combined effects of Sections *a*, *b*, *c*, *e* and *f*, examples have been worked out in three parts.

Part 1.—The effect of increasing design r.p.m. on an engine of constant cylinder capacity fitted to a very clean monoplane.

Part 2.—The effect of varying engine size and r.p.m. at constant b.h.p. (fitted to above monoplane).

Part 3.—Cases used in Part 2 when fitted to cheap biplane without any fairings.

This must not be looked upon as a comparison between monoplane and biplane. The choice of the types is purely due to the fact that the monoplane gives a better rate of climb than a biplane, all other things being equal, and consequently would probably fly equally successfully with a smaller engine. The cases merely represent two extremes.

Such things as hangar space, initial cost, etc., are beyond the scope of this article. We are only concerned with the type of aeroplane in so far as the speed and body characteristics affect the airscrew performance.

Part 1 : The effect of increasing design r.p.m. on engines of constant cylinder capacity fitted to very clean monoplane

The engine chosen for this investigation is of 2 litre capacity, having five cylinders of 2.75 in. diameter and 2.94 in. stroke.

In a previous article (Ref. 3) it was shown that the power of an engine could be expressed empirically in terms of capacity and r.p.m. as under.

$$P = K.C.N.^{\cdot 71} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

where P = b.h.p. at normal r.p.m.
N = Normal r.p.m.
C = Cubic capacity of "swept volume" in cu. in.
K = Constant, depending upon design conditions varying from 0.00094 to 0.00154 with different makes.

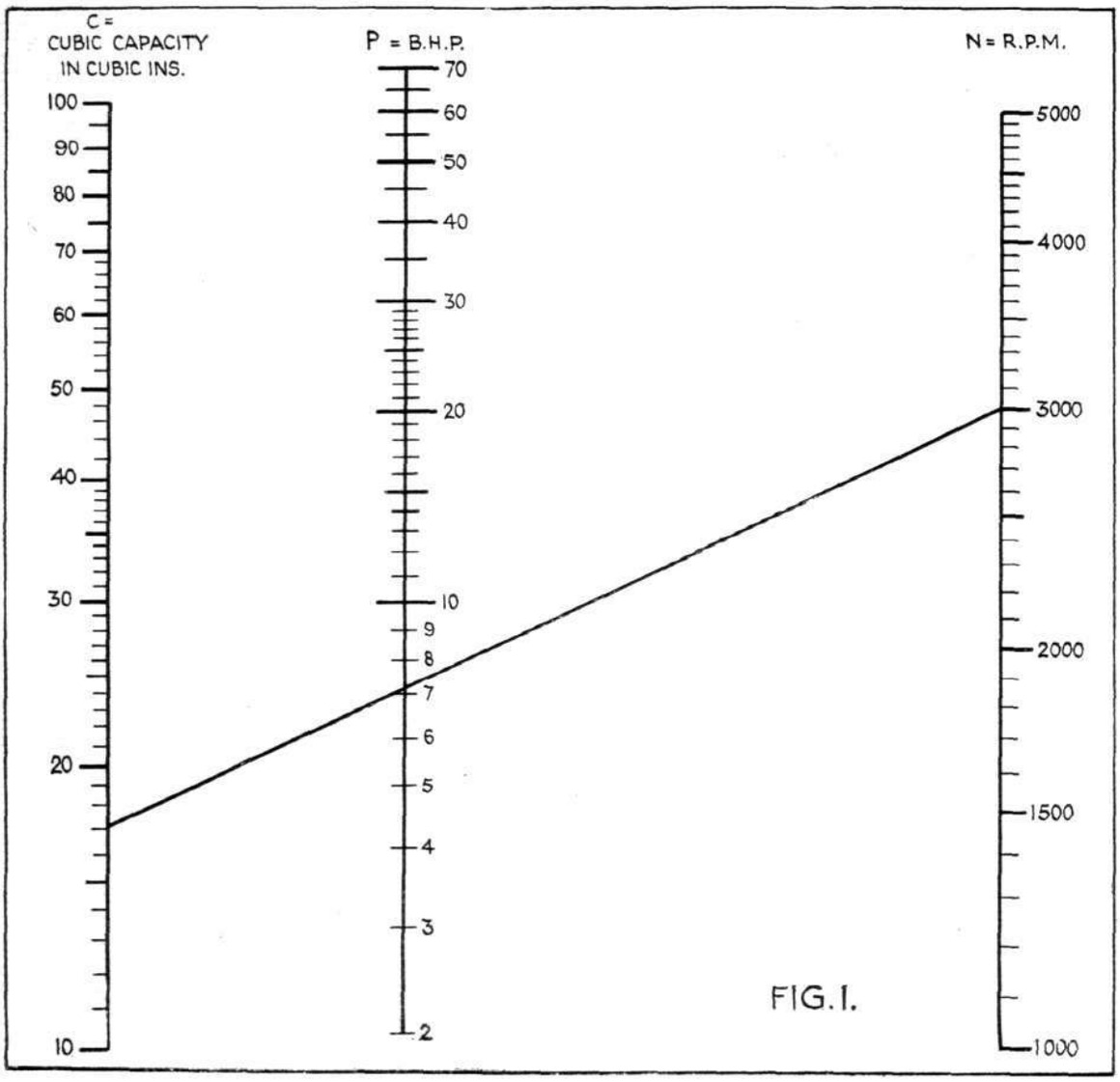


FIG. 1.

For the purpose of our investigation the value of K is supposed to be 0.00145 so that

$$P = 0.00145\ C\ N.^{\cdot 71} \quad \ldots\ldots\ldots\ldots\ldots \quad (2)$$

This is shown as a nomogram in Fig. 1.

This nomogram can be used for any size of engine by following the instruction given in the note.

For instance, the "Pobjoy" engine for which the following data are published in FLIGHT (Ref. 2):—

Capacity = C = 170 cu. in.
Normal r.p.m. = N = 3,000 r.p.m.
Normal power = P = 75 b.h.p. rated.

To use the nomogram, connect $C = \frac{170}{10} = 17$ with N = 3,000 (as drawn) and read off P = 7.2.

Therefore, the normal b.h.p. is 10 × 7.2 = 72 b.h.p. as compared with 75 actual which represents an error of 4 per cent.

The capacity of the engine used in our investigation is 122 cu. in. (2,000 c.c.) so that the following table of powers can be compiled.

TABLE 1

Engine No.	Normal r.p.m.	Normal b.h.p.	Max. r.p.m.	Max. b.h.p.	P/n^3 normal	P/n^3 max.
1	1,500	31·8	1,650	34·4	0·002035	0·001655
2	2,000	39·1	2,200	42·3	0·001015	0·000826
3	3,000	52·1	3,300	56·3	0·000416	0·000338
4	4,000	63·9	4,400	69·2	0·000216	0·0001759
5	6,000	85·3	6,600	92·3	0·0000853	0·0000694

The relative powers at other than normal r.p.m. are given by Fig. 2.

The diameter of the Townend ring and the maximum body diameter is taken as the same, and equals 2.5 ft.

It has been shown (Ref. 4) that the net thrust h.p. (t.h.p.) of an airscrew can be expressed as

$$\frac{\text{Nett } \eta}{\text{Free } \eta} = 1 - \frac{3{\cdot}21\ h\ K_B S_w}{D^2} - \frac{0{\cdot}253\ d^2}{D^2} \quad \ldots\ldots(3)$$

where K_B = Body drag coefficient

$$= \frac{\text{Drag lbs.}}{\rho \cdot \sigma S_w V^2}$$

h = Amount of body drag affected by slipstream.

S_w = Wing area in sq. ft.

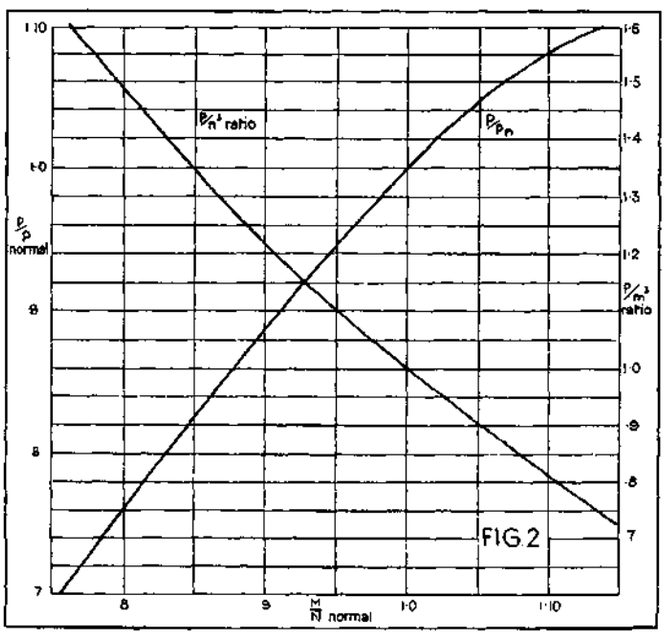
D = Airscrew diameter feet

d = Body diameter feet.

If we assume a wing area of 160 sq. ft. and $h = 0{\cdot}6$ and $K_B = 0{\cdot}0055$, then 3 becomes

$$\frac{\text{Nett } \eta}{\text{Free } \eta} = 1 - \frac{3{\cdot}28}{D^2} \quad \ldots\ldots(4)$$

The body drag coefficient of 0.0055 associated with a wing area of 160 sq. ft. represents a parasite drag of 45 lb. at 100 m.p.h.



It would need very careful streamlining, wheel fairings, etc., to get down to this figure, so that this probably represents the best which may be expected for an aeroplane of this type.

We now only require the weight and the wing characteristics to obtain the power required for our aeroplane.

A suitable wing for cantilever construction would have a mean thickness of 12 per cent. of the chord, and a camber of centre-line of 3 per cent. of the chord, giving a no-lift moment of −0.026.

A method of estimating profile drag and maximum lift has been previously given (Ref. 5).

We will assume that the aspect ratio of the wing will be 7.0, which represents a span of 35 ft., not allowing any lift over the part of the wing covered by the body.

The induced drag is thus given by

$$K_{D_i} = 0{\cdot}091\ K_L^2 \quad \ldots\ldots(5)$$

The overall characteristics of the wing are then as follows:—

TABLE 2

K_L	K_{D_p}	K_{D_i}	$K_D = K_{D_p} + K_{D_i}$
0·07	0·0049	0·0005	0·0054
0·08	0·0049	0·0006	0·0055
0·10	0·0048	0·0009	0·0057
0·11	0·0048	0·0011	0·0059
0·12	0·0049	0·0013	0·0062
0·15	0·0049	0·0020	0·0069
0·2	0·0050	0·0036	0·0086
0·3	0·0052	0·0082	0·0134
0·45	0·0063	0·0184	0·0247
0·6	0·0089	0·0327	0·0416
0·75	0·0193	0·0512	0·0705

If the gross weight is taken as 800 lb. then the t.h.p. required for level flight is found as under.

TABLE 3

K_L	K_R	Drag, lbs.	$V\sqrt{\sigma}$	t.h.p. $\sqrt{\sigma}$
0·07	0·0109	124·6	118·3	39·3
0·08	0·0110	110·0	110·7	32·5
0·10	0·0112	89·6	99·0	23·6
0·11	0·0114	82·9	94·4	20·9
0·12	0·0117	78·0	90·4	18·8
0·15	0·0124	66·1	80·8	14·2
0·20	0·0141	56·3	70·0	10·5
0·30	0·0189	50·4	57·1	7·7
0·45	0·0302	53·6	46·7	6·7
0·6	0·0471	62·7	40·4	6·8
0·75	0·0755	80·6	36·2	7·8

The next factor to be determined is the aspect ratio of the airscrew blades.

For normal airscrews the writer has found that in

order to obviate excessive sweep forward (tilt) of the blades the following relationship gives a guide.

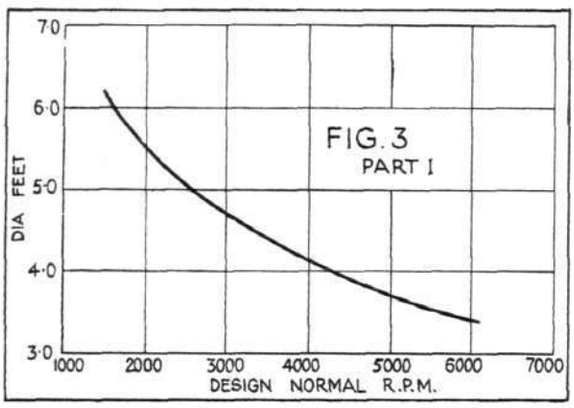
$$K = 14.5 - 0.65 \left(\frac{P_m}{D}\right)^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$

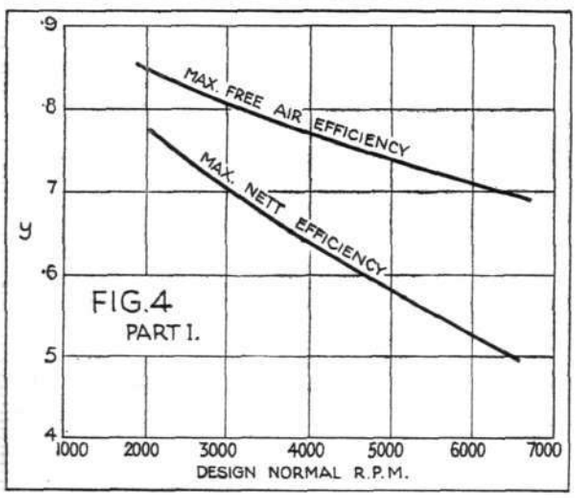
K = Aspect ratio.
P_m = Maximum b.h.p.
D = Airscrew diameter.

This relationship is assumed to hold for these small airscrews.

The method of obtaining the airscrew characteristics is a modification of that described in FLIGHT, February 20, 1931—"Calculation of Airscrew Characteristics."

It is not known how reliable the methods employed would be when applied to such small airscrews and b.h.p's., but the results obtained will at any rate be relative.





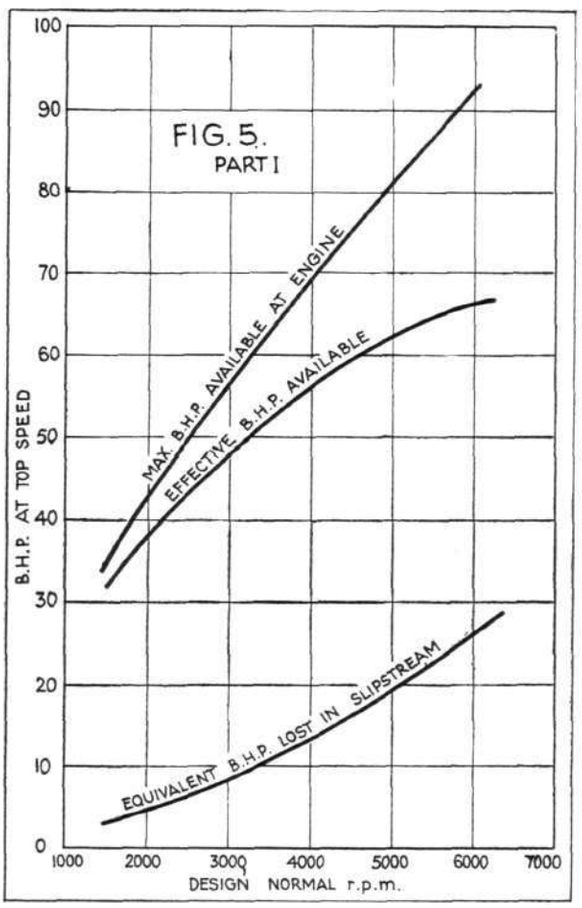


Fig. 3 gives the variation of airscrew diameter with design r.p.m., it being assumed that the face pitch of the airscrew (Pf) = V/n at top speed, at which the maximum permissible r.p.m. of the engine occur.

The free air and net airscrew efficiencies, Fig. 4, clearly show the big losses as the airscrew size decreases.

In Case 5 the losses due to slipstream effect and interference amount to 28.5 per cent. of the total power of the engine; in Case 1 this is reduced to 8.5 per cent.

The power available in Case 1 is 34.4, so that the losses are 2.9 b.h.p. and in Case 1 the b.h.p. is 92.3, so that the b.h.p. lost due to this cause is 26.2 b.h.p.

This is shown more clearly by Fig. 5, where it is seen that any further increase in design r.p.m., although giving an increase in b.h.p., would produce little increase in effective b.h.p. available.

If one combines this with the drop in free efficiency shown in Fig. 4, the peak in effective t.h.p. occurs earlier than that of b.h.p. (see Fig. 6).

Fig. 7 shows the Thrust h.p. at full throttle at any speed for all five cases, and shows also the t.h.p. available when cruising at normal r.p.m.

Fig. 8 gives in graphical form the major characteristics of the aircraft, where it is observed that rate of climb, maximum speed and cruising speed all peak at about 6,000 r.p.m.

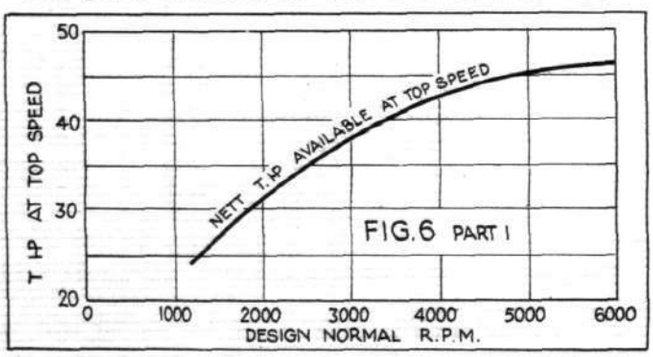
It is assumed that the primary object of the really light aeroplane is a matter of cost, not only initial, but running cost. It is safe to say that the slow-running engine will require no more attention than the fast-running one, so the maintenance cost will be the same, or perhaps in favour of the slow-running engine. The initial cost of the slow-running engine in the series under discussion would certainly be less. The criterion then seems to be the fuel and oil used. There are no statistics on the oil consumed by an engine, so that this will be taken as the same m.p.g. for all five engines.

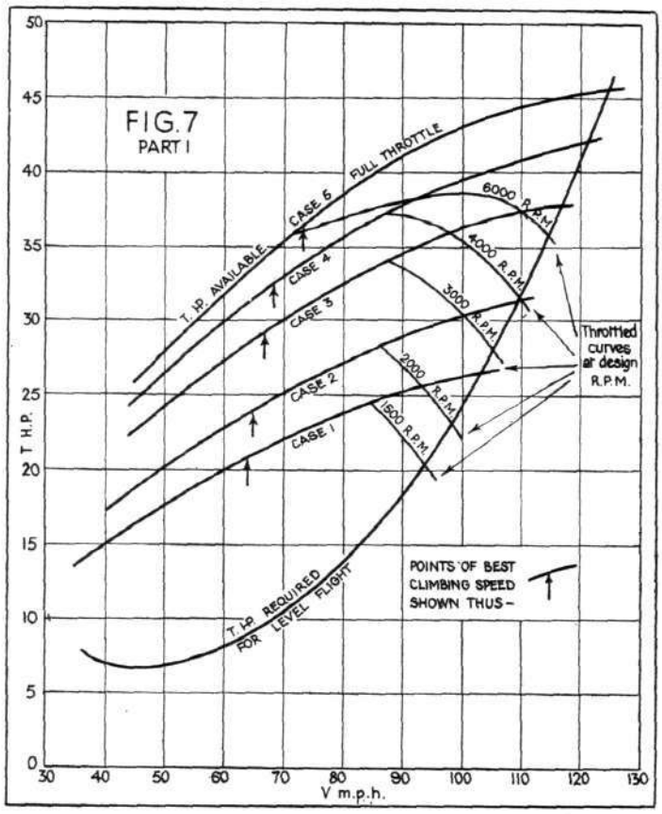
All the five engines run on practically the same throttle when cruising at normal r.p.m., so that unless fuel economy is a function of piston speed as well as the amount of throttling, the specific consumption for each engine cruising is taken as 0.6 pt./b.h.p./hr. The resulting consumption is shown in Fig. 9.

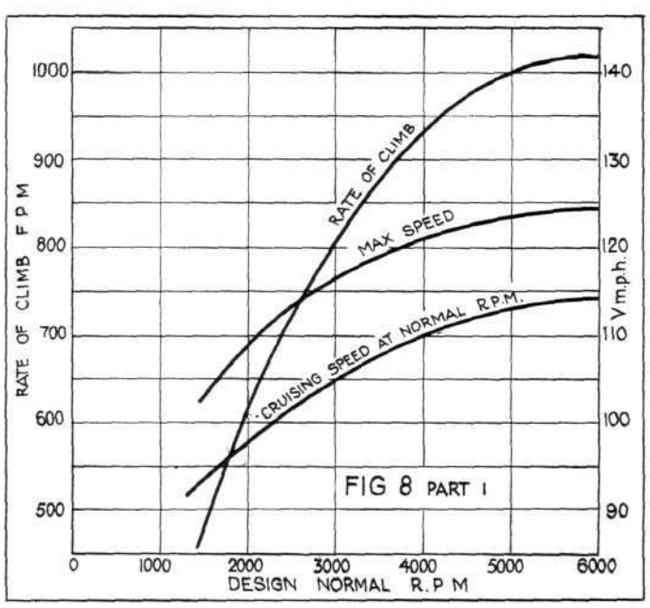
An increase in r.p.m. from 1,500 to 6,000 means an increase of 20 m.p.h. (22 per cent.) in cruising speed at the expenditure of twice the fuel for the same distance.

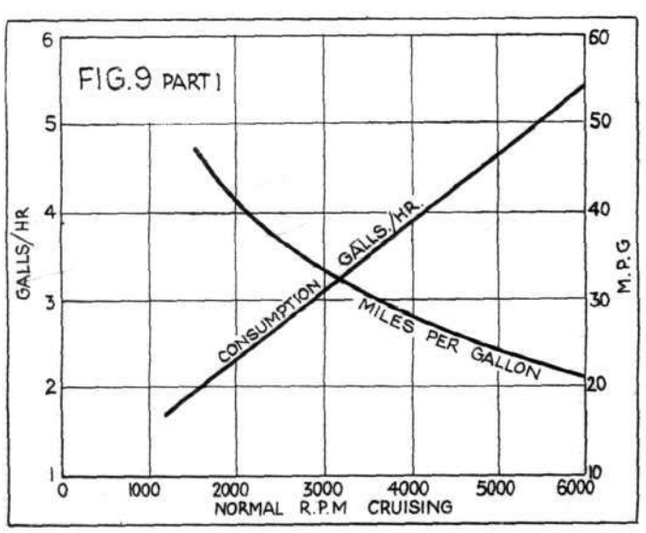
The choice of suitable engine r.p.m. eventually resolves into the one giving the minimum permissible rate of climb, since this quantity is the only important one adversely affected by decreasing r.p.m.

Before concluding the first part of the article, a word









about weight will not be out of place. No change in weight has been allowed for in any of the investigations, but when considering some specific case this has to be done. Not only is this due to fuel load and engine weight, but also to extra wing and structure weight for carrying the extra loads applied.

Take for example Cases 1 and 5. The engine weight for Case 5 would be more than for Case 1, but the airscrew would be lighter. The weight of the power plant without fuel tanks would be about the same in both cases. The fuel carried in Case 5 would be over twice that in Case 1. If a range of 400 miles is allowed then Case 5 will carry 19 gallons and Case 1 8.5 gallons, a difference in weight of 80 lb. in fuel alone. The structure difference would be about 20 lb., so that Case 1 would be 100 lb. lighter than Case 5.

Another point which is worthy of attention is the tip speed in Case I, which is 1,175 f.p.m.

No allowance is made for tip speed effect since the cases are purely illustrative and must be kept on a comparative basis.

The piston speed also works out at something over 3,000 f.p.m., so that as an engine Case 5 is an impossibility, but as a point on a curve it serves our purpose.

REFERENCES.

(1) "Light Aero Engine Development," Lieut.-Col. L. F. R. Fell, "Proceedings," I.A.E., 1924—5.
(2) "The Swing of the Pendulum," Editorial Comments, FLIGHT, October 13, 1932.
(3) "Aircooled Engine Power and Weight," W. R. Andrews, A.F.R.Ae.S., AIRCRAFT ENGINEER, July 24, 1931.
(4) "Notes on Airscrew-Body Interference," W. R. Andrews, AIRCRAFT ENGINEER, October 27, 1932.
(5) "The Estimation of Profile Drag," W. R. Andrews, AIRCRAFT ENGINEER, June 17, 1932.

(*To be continued.*)

NOTES ON THE USE OF STAINLESS STEEL IN AIRCRAFT STRUCTURES

By H. J. POLLARD, Wh. Ex., A.F.R.Ae.Soc.*

To the layman "stainless" steel has the unequivocal meaning implied by the word, that is, one and only one material that is stainless with the added characteristic of knife hardness. Actually "stainless steel" covers a wide range of different alloy steels, none of them absolutely stainless; some much more corrodible than others. Some of these steels are file-hard, others not much harder than lead.

The phrase "stainless steel" is of such universal use that an attempt to supplant it by a more accurate descriptive name such as "corrosion-resistant" would be foredoomed to failure. We will therefore make no departure from the name standardised by long usage, but as the following notes show, it is not a question of describing a single material but groups of materials requiring more than 20 D.T.D. and B.E.S.A. specifications for aircraft structural use alone. How many times these specifications are multiplied when the requirements of the cutler, ornamental architect, kitchen ware and household fitting manufacturer, motor engineer, turbine, steam and petrol engine designer, chemical or mining engineer, etc., etc., are met, the writer has no means of knowing.

The first requirement of the aircraft engineer is that by the substitution of stainless steels for the steels normally used, the structure shall not become heavier or less strong; also that the methods of construction and fabrication which have become standardised shall not require much modification for the new material.

This latter consideration impeded the use of stainless steel in spars, ribs, etc., for years, as, with the strip available, strength and ductility could not be combined to a sufficient degree to enable the formation of small corrugations without cracking as in the case of the steels ordinarily used. In cases where sufficient

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ductility was obtained, the strength was lowered past the figure at which an economic structure could be built.

Manufacturers have now overcome the difficulty, and the following is a typical analysis of stainless steel strip which, with suitable manufacturing technique and heat-treatment, will give 65 tons/in.² proof stress at 0.1 per cent. plastic extension, together with as much ductility as is obtained in the older non-stainless material.

C	Si	Mn	Ni	Cr
0·2	0·35	0·35	2·5	18·5

The requisite mechanical properties of this material are obtained by hardening and tempering; this steel is not quite corrosion proof; the steels of the group next mentioned are more nearly so. The specification for the material is High Tensile Strip D.T.D. 60A. Subsequent to the issue of that specification great progress has been made in raising the mechanical properties of the steel; the figures just quoted have been attained, but it cannot yet be stated what the optimum figures are for the strength and ductility of this strip. When further data on this point become available the issue of new specifications, requiring higher strengths, can confidently be expected.

As bar, the material is supplied to specification S.80, and most A.G.S. parts are made from such bar, whilst as sheet for fittings D.T.D.146 is the appropriate specification.

The rate of corrosion of this class of material under ordinary atmospheric conditions is exceedingly slow; inside a wing or fuselage no protective coating is necessary, although patches of rust or pitting may appear here and there. The loss in strength, however, over very long periods of time is hardly measurable.

This material is used for purposes other than aeroplane parts, *i.e.*, for centrifugal pump spindles, motor-boat propeller shafts, etc., which says a good deal for the corrosion-resisting qualities, but for aircraft subjected to marine conditions a protective coating is probably desirable. Another advantage with the foregoing class of stainless steel is that it responds to heat-treatment generally in the manner to which the user of the earlier types of Ni-Cr steel is accustomed.

In cases where greater resistance to corrosion is necessary, as for example flying-boat hulls, seaplane floats or exposed fittings on such aircraft, one of the austenitic group of stainless steels must be used. For example, sheets to D.T.D.166 or 171, and rivets to D.T.D.24A., whilst bars are supplied to D.T.D.176, and tubes are made from these bars.

The mechanical properties of this group are obtained by cold work, and great hardness may be obtained by this means. The only effect of heat-treatment is to soften it, and the fully softened condition is obtained by quenching in water from a temperature of 2,000 deg. F. For structural purposes this material compares rather unfavourably with the group of which S.80 is a member, *i.e.*, the "18-2" group, and a great deal still remains to be learned about it, but at present the yield strength for calculation purposes should not exceed 40 tons/in.² against the 65 tons per sq. in. which can, in the appropriate circumstances, now be taken as the stressing figure for structural members made from strip to "super" D.T.D.60A.

A typical analysis of the austenitic steel is:—

C	Si	Mg	Ni	Cr	Tung
0·11	0·56	0·27	8·5	18·8	0·8

For hulls the material appears to be ideal, while it is used extensively for fittings for all aircraft. Its great attraction for such parts is the comparative ease with which the sheets can be bent, the absence of any heat-treatment after the manufacture of the fittings, and the stressing figure of 40 tons per sq. in. Owing to the work-hardening qualities, there is a limit to the extent to which the material can be hammered, and it would, in consequence, appear desirable, in cases where a good deal of pressure is used, that hardness tests should be made in the region of maximum deformation, so that from the figures obtained the degree of ductility at such places could be determined.

Fittings should, of course, be so designed as to make the application of excessive cold-work unnecessary.

Another characteristic of this group is its non-magnetic quality. This is of great importance in relation to compass installation.

In passing it may be stated that this material is not non-magnetic in all states. After a large amount of cold working the non-magnetic properties are to some degree lost, but in the state suitable for aircraft use the material may be regarded as sensibly non-magnetic. Moreover, in the very high tensile state the corrosion-resisting property is definitely inferior to that in the annealed state.

The third group of stainless materials is known as the stainless iron group. This material is used where the corrosive conditions are not too severe, and for parts where very easy machining conditions are required, or where easy forging or drop-stamping is necessary. Stainless iron is suitable for low-stressed fittings, but the first, or general-purpose group, must be drawn on where higher stresses are involved. Stampings and forgings can readily be obtained to specification S.80, so that unless cost of material is a serious factor, there is no real need to use stainless iron for this purpose.

A typical analysis of the material is as follows:—

C	Si	Mg	Ni	Cr
0·1	0·26	0·22	0·2	13·5

The specification for sheets of this material are D.T.D.23B., D.T.D.39 (softer sheets, lower carbon than in typical analysis quoted); low tensile bar D.T.D.53, medium tensile bar S.61. Strip of 35 tons proof stress D.T.D.158. Three specifications of tubes also belong to the stainless iron group, these being D.T.D.'s 97, 102 and 105.

With an increase in the carbon content (but otherwise similar analysis) higher strength figures are obtained, and the material passes out of the group of stainless irons. Strip to D.T.D.46A. having a proof stress of 65 tons/in.² belongs to this subsidiary class, as does S.62, a bar having a maximum stress of 46 to 52 tons/in.²

It is evident then that there is a stainless steel or iron for every aircraft structural purpose, except axles and tail-skids; no stainless tubes are as yet available as a substitute for material to specification T.2. The reason for this is probably that no call has been made for such tubes. There appears, however, to be no reason why non-corrodible tubes of strength equal to that of T.2 should not be made.

As regards workshop processes, no new operations are required on these steels or irons, but modifications to the practices employed with the ordinary carbon or low chromium steels are necessary. All the requisite information is, of course, readily supplied by the steel-makers, such for example as best lathe tool angles, drill angles, tap tapers, saw blade particulars, data on cutters for milling, hobbing, planing, etc. It is essential that suitable modification to ordinary machine shop practice should be made before any work is commenced. Even fitting practice has its special requirements when using stainless steel; filing for example should be done slowly and flatly with high-speed files.

The question of stainless rivets is not a particularly simple one. Rivets are required that may be upset with the same ease as ordinary mild steel rivets. Group 3 might furnish such rivets, but it has been ascertained that there is a difference in potential electricity between materials groups 1 and 3. Consequently the use of stainless iron rivets with austenitic plate should be avoided, particularly on marine craft. Rivets from the intermediate group may be

used either with "18-8" or "13-1." Fairly soft rivets may be made from S.80 material (produced as wire) fully softened. Such rivets approximate to D.T.D.146 as regards ductility, but they are definitely harder than similar parts in mild steel. "18-8" rivets (D.T.D.24A.) give satisfaction provided they are in the softest condition, and providing they are upset by squeezing. Hammering can be done successfully only if the rivets are really soft, and providing the operator realises that the more he strikes the rivet shank the harder will the surface of the partially-formed head become. In other words, the amount of work expended in forming the head should be reduced to a minimum.

The subject of welding is much to the fore in aircraft as in other structures. Even in structures where welding is not allowable in the primary structure, welding may possibly be used on large numbers of fittings employed in the secondary structure or in equipment installation. Most of the stainless steels, particularly the austenitic variety, can readily be welded, but the fact should not be overlooked that the strength near the weld, in the austenitic material, is only 12 tons per sq. in. yield or thereabouts, the material there being in its softest state.

The "heat-treated" steels need a further heat-treatment after welding (tempering will relieve only the internal strains set up by welding). The proper micro-structure of the metal can be partially restored only by a full heat-treatment.

Where bar, tube and sheet are to be fabricated into fittings by welding, material to specifications S.61, D.T.D.97 and D.T.D.23B. may be used. Stainless iron filler wire should be employed in this case. It is obviously undesirable to weld material from one group to material from another group.

The de-scaling of these materials after welding is an essential workshop process, and reference should be made to the steelmakers for the de-scaling solution for any particular steel. For the austenitic steels the composition of the bath may be:—

Water	... ...	50 parts by volume.
Hydrochloric Acid	...	50 ,, ,, ,,
Nitric Acid	... ...	5 ,, ,, ,,
Restrainer	... ...	0·25 ,, ,, ,,

The purpose of the latter constituent is to inhibit the attack on the metal without having any material effect on the attack on the scale. A temperature of 60 deg. C. should be maintained during the immersion. The loosened scale is easily removed after a few minutes, by washing in water and scrubbing, after which it is advisable to immerse the steel in a neutralising bath of soda solution.

Alternatively, sand blasting only may be used for the removal of scale. Where the process is "shot-blasting," the articles need an after immersion in a nitric acid bath to remove any trace of ordinary steel, and a subsequent washing. Unless materials belong to the austenitic group, a coat of varnish or other protection should be applied to de-scaled welded fittings.

Appended is a list of Air Ministry and B.E.S.A. published specifications. As experience with the various materials widens, it is reasonable to expect modifications to the substance and to the number of the existing specifications; some will become obsolete as others are added. Tube makers, for example, are busily engaged experimenting on the manufacture of, and in some cases producing, tubes for inclusion in groups 1 and 2. It is probably safe to forecast that providing a tube suitable for welding becomes available under group 2, then the present use of the stainless iron group where a welded fitting consisting partly of tube, partly of plate and partly of bar is required will give way to the universal use of the "18-2" materials for this purpose. Thus a substantial saving in specifications should become possible.

It is, in fact, electric welding (resistance) of the general-purpose group that may cause drastic alterations in the methods of manufacture and even design of aircraft.

The material in fairly thin sheets suffers little loss in strength at or near the welds. There is, however, some loss in ductility; if this loss proves not to be serious, then obviously great possibilities are opened up in the matter of quick production. The electric welding of "18-8" has long been known and practised in America, but because of the superior safe strength of "18-2," that material may take precedence over the other for the purpose. Experiments are being actively carried out on this work, but general conclusions cannot as yet be drawn.

STAINLESS STEELS FOR AIRCRAFT STRUCTURES

	Tube	Bar	Sheet and Strip	Remarks
Group No. 1 "18-8"		D.T.D. 176 (Soft), 15 tons P.S. D.T.D.24A (Rivets) D.T.D.61 (Welding Wire)	D.T.D.57B (40 tons Proof Stress) D.T.D.166 (40 tons P.S.) D.T.D.171 (Soft), 15 tons P.S.	*Austenitic Group* Non-magnetic unless excessively cold worked. Best resistance to corrosion. After welding, the resistance to corrosion is slightly impaired.
Group No. 2 "18-2"		S.80 (55 tons Min. S.)	*D.T.D.60A (45 tons P.S.) D.T.D.146 (30 tons P.S.) "Super" D.T.D.60A (No specn.) yet issued, but material available having 65 tons proof stress with ductility adequate for the forming of corrugations of small radius	*General Purpose Group (High Tensile)* Responds to ordinary heat treatment. Very good resistance to corrosion. Varnishing, etc., not necessary on land planes. Corrosion quality impaired after welding*, 45 tons proof stress for. D.T.D.60A is for 0·5 per cent. plastic extension. In all other cases, proof stress is given for 0·1 per cent. plastic extension.
Group No. 3 "13-1"	D.T.D.97 (18 tons P.S.) D.T.D.102 (30 tons P.S.) D.T.D.105 (40 tons P.S.)	S.61 (35–45 tons max. S.) *S.62 (46-52 tons max. S.) D.T.D.53 (30-35 tons max. S.)	D.T.D.158 (35 tons P.S.) D.T.D.23B (30-40 tons max. S.) D.T.D.39 (28-35 tons max. S.) *D.T.D.46A (65 tons P.S.)	*Stainless Iron Group.* Responds to ordinary heat treatment. *An addition to the carbon contents gives D.T.D.46A (H.T. strip) and S.62 (a moderately high tensile bar). All materials in this group are more corrodible than the materials in group No. 2.

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

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NOTES ON RECOVERY FROM A SPIN. By L. W. Bryant, A.R.C.Sc., and Miss I. M. W. Jones. R. & M. No. 1426. (24 pages and 18 diagrams.) March, 1932. Price 1s. 3d. net.

The investigation of the theory of spinning has now reached a stage when some further definite conclusions of fundamental importance may be drawn. Since the publication of R. & M. 1001*, a considerable quantity of data from model experiments on the rolling balance at the National Physical Laboratory have been steadily accumulated, and this has rendered possible a fruitful examination of the stability of the spininng motion, and of the comparative effects of the three controls when applied to initiate recovery from a steady spin. In the present report, the conditions of equilibrium in the steady spin, already given in most essential details in R. & M. 1001, are reviewed in the light of later data, and they are examined from the point of view of the relative effectiveness of the controls in changing the character of the spin or in stopping it. When the controls are set for recovery it is found that new states of spin equilibrium may be possible, and the study of these possibly dangerous spins is clearly of the greatest importance; some attempt at investigating their stability is now being made.

A detailed calculation has been carried out to find the initial motions following the application of controls. Starting from the first two of the steady spins recorded for the Bristol Fighter in R. & M. 1261†, one at an incidence of 32·4° and the other at 53°, the authors have estimated the necessary derivatives with the help of the best available data, and have calculated the stability of the motion and also the effects of rolling, pitching, and yawing couples (referred to body axes) separately applied against the spin.

Conclusions.—(1) Sideslipping in a spin introduces a rolling moment (body axes) which is large even for a small angle of sideslip, and any factor which produces a pure rolling couple against a spin will, in general, be nullified by a change of sideslip.

(2) Sideslipping also introduces a yawing moment which may be of either sign for either direction of sideslip, but is invariably small. Hence, any factor which can provide a moderate yawing for recovery will not be counteracted by changes of sideslip.

(3) It thus appears that the rudder is by far the most effective control for the purpose of recovery from an established spin; and

(4) Ailerons do not assist recovery by virtue of their rolling couple; their influence in assisting or retarding recovery will be governed by the yawing moment they produce.

(5) Reversal of the elevators without other control movements may lead to another and faster steady spin more stable than the original, and possibly even at a higher incidence. It is probably better to reverse the rudder in a flat spin before moving the stick, and to move the latter when the rate of spin is observed to fall off.

The variations of sideslip exert a very important influence on all motions of a spinning type; they are accompanied by appropriate variations of pitching rotation and incidence which determine the all-important changes in the main angular velocity about the vertical.

The centrifugal yawing couple due to A—B may cause serious delay in recovery in certain critical cases where A—B is considerably negative, rudder power is poor, and rate of spin high. This is particularly true of the spins characterised by considerable negative sideslip and great stability in roll; such spins are usually much more stable than the normal flat spin type with little sideslip.

* R. & M. 1001. "The Spinning of Aeroplanes," Gates and Bryant.

† R. & M. 1261. "Experiments on the Spinning of a Bristol Fighter Aeroplane." K. V. Wright.

DESIGN AND TEST DATA FOR AIRCRAFT RADIATORS. By C. Anderton Brown, A.M.I.Mech.E. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1461. (56 pages and 25 diagrams.) May, 1932. Price 3s. net.

This Memorandum deals with several problems affecting radiator design and has been divided into four parts, so that reference to different aspects of the subject may be simplified.

In Part I, the suitability figures for radiators are discussed, and a method is proposed to co-ordinate the results of tests at different air-temperatures. Minimum suitability figures are suggested for aeroplanes and seaplanes in temperate and tropical climates.

In Part II the results of tests of water circulating-pumps are analysed and an equation is proposed for naturally-aspirated and supercharged engines, connecting rates of circulation at different water-temperatures and altitudes.

In Part III a method of determining the altitude of minimum suitability of radiators is outlined, and curves are deduced for a range of aircraft in temperate and tropical conditions on certain assumptions.

In Part IV the relation between jacket H.P. at sea-level and at altitude is discussed; existing data on the cooling, drag and weight of honeycomb, tube-blocks are arranged conveniently: standard temperatures, densities, etc., are tabulated for computation of water-radiators and honeycomb-condensers and formulæ are given for estimating radiator areas, drags and optimum calibre of tubes.

In various appendices examples are worked out for particular cases.

A METHOD OF TESTING THE STRENGTH AND STIFFNESS OF A LARGE WING. By I. J. Gerard, M.Sc., Assoc.M. Inst.C.E., A.F.R.Ae.S. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1462. (5 pages and 6 diagrams.) January, 1932. Price 6d. net.

A preliminary design of an all-metal semi-cantilever wing of 40 ft. total length and 24 ft. cantilever was made by the Bristol Aeroplane Company. In order to develop this design it was considered expedient, first, to consider what method of test could conveniently be devised which would determine the strength of the wing when constructed and which would ensure sufficient accuracy of test results combined with minimum damage. In this way it was hoped to gather a maximum amount of design data with minimum expenditure of time and loss of material.

Means were provided for mounting an all-metal semi-cantilever wing of 40 ft. total length in the normal attitude of an "L"-shaped test structure, so that the development of compression failure in the skin or in adjacent members could easily and safely be observed during the test. Loading was applied to represent two cases: (1) straight flight, and (2) aileron applied. Loads were distributed along the wing spars hydraulically and along the ribs by levers. Deflection of the spars and extension of the lift-ties were measured.

Where it is necessary to make a series of similar tests on the same or on similar structures, this method of test fully justifies the fairly high initial cost of making the test apparatus. It is quick, accurate and safe, and it determines the ultimate strength of the structure under test with minimum damage.

NOTE ON THE DISTORTION OF THIN TUBES UNDER FLEXURE. By A. J. Sutton Pippard, M.B.E., D.Sc., M.Inst.C.E. R. & M. No. 1465. (5 pages and 4 diagrams.) May, 1932. Price 6d. net.

The method of failure of a tube subjected to flexure depends upon the thickness of the wall relative to the diameter. When this is greater than a certain value, stress conditions alone will determine the maximum bending moment the tube will sustain, and strength calculations may be made by the usual theory of bending. Such tubes may be called thick to differentiate them from thin tubes in which another type of failure occurs. The behaviour of thin tubes has been investigated mathematically by L. G. Brazier,* who has shown that a progressive flattening of the cross-section at right angles to the axis of bending is associated with an increasing couple: a critical value of this couple is finally reached which produces a stage of instability in the tube. In this note an attempt is made to exhibit Brazier's results in diagrams which enable the essential points to be determined with the minimum of trouble.

The limiting value of the ratio of wall thickness to radius for solid-drawn tubes appears to be about 0·02 and the maximum stress obtainable with them not more than 60 tons per square inch. With these limits the material of such tubes will always reach the limiting stress before a condition of instability is reached.

In certain cases tubes made from strip metal will have a much lower value of the same ratio, and if the proof stress is 60 tons per square inch the question of stability will need consideration when the ratio reaches the neighbourhood of 0·015.

* On the Flexure of Thin Cylindrical Shells and other "Thin" Sections. L. G. Brazier, Proc. Roy. Soc., A., Vol. 116, 1927, p. 104.

APPLICATIONS TO AERONAUTICS OF ACKERET'S THEORY OF AEROFOILS MOVING AT SPEEDS GREATER THAN THAT OF SOUND. By Professor G. I. Taylor, F.R.S. R. & M. No. 1467. (7 pages and 8 diagrams.) April 26, 1932. Price 6d. net.

A simple theory of the forces on thin aerofoils moving at speeds greater than that of sound has been given by Ackeret.* According to this theory the disturbance due to the moving aerofoil consists of two plane waves which are propagated outwards like sound waves, each making the "Mach angle," namely $\sin^{-1}(a/V)$, with the direction of motion of the aerofoil.

The theory only applies to cases where the surface of the aerofoil makes everywhere a small angle with the direction of motion and to aerofoils with a sharp leading edge, and in seeking experimental evidence concerning its applicability to aeronautics one's attention is, obviously, directed to the case of biconvex aerofoils (*i.e.*, aerofoils consisting of two arcs of circles), one of which was tested by Stanton† in his high-speed wind tunnel at a speed $V = 1{\cdot}7a$.

It will be seen that the limitation imposed by the necessity in Ackeret's regime for the first wave of compression to spring from the pointed nose of the aerofoil, is most drastic at speeds near that of sound. As the speed gets higher the permissible angle between the upper and lower surfaces at the nose gets larger, but when this angle becomes comparable with the "Mach angle" M, another kind of limitation becomes effective, the approximation used in sound-wave equations becoming inaccurate.

The Mach angle decreases, roughly, proportionally to the speed of the aerofoil, so that at very high speeds, as well as at speeds near that of sound, it is possible to apply Ackeret's method only to very thin aerofoils at very small angles of attack.

Subject to these limitations, it seems that the conclusions reached by the use of Ackeret's formulæ are likely to be verified in practice, and in particular the conclusions about the maximum values of L/D should be fairly accurate.

Comparatively high values of L/D can only be attained by the use of thin aerofoils, and then the range of angles of incidence over which these high values are obtained is small. It will be seen, for instance, with a thin symmetrical biconvex aerofoil of thickness 1/20 of the chord the range of incidence for which L/D is greater than 7·0 is from $a = 1{\cdot}6$ to $6{\cdot}5$ deg. If these results could be applied to the design of an airscrew to work at speeds greater than that of sound, the constructional disadvantage of using thin blades might be counteracted to a certain extent by the fact (inherent in formulæ (9) when $\beta m_1 = \beta m_2$) that the centre of pressure of a symmetrical biconvex aerofoil is situated at the centre of the section.

* "Luftkräfte auf Flügel die mit Grösserer schallgeschwindigkeit bewegt werden." J. Ackeret, Zs.F.M., 16, 72, 1925.

† "A High-Speed Wind Channel for Tests on Aerofoils." R. & M. 1130.

AIR TRANSPORT

RUSSIA AND HER AIRSHIPS

By H. ADDINELL

BEFORE commencing the description of the comprehensive plans for the furtherance of airship travel and development inaugurated by the U.S.S.R., I should like to acknowledge the assistance and information received from Kapitan a D. Helmut Beelitz, a well-known German authority on lighter-than-air craft, and Editor of the *Monatshefte fur Luftschiffwessen*, the only journal dealing solely with airship matters. Kapitan Beelitz is in close touch with airship development the whole world over and is, therefore, in the unique position of receiving official information from authoritative sources.

In no country in the world, not even America, is the construction of lighter-than-air craft undertaken with such enthusiasm and complete official support as in Russia. Up to the present England and the U.S.A. have only attempted to solve the airship problem by the building of gigantic structures which naturally employ the rigid system of construction. Of the smaller types of semi-rigid and non-rigid ships there are none in this country and very few examples in France and the U.S.A. It has been left to Russia to further the experiments with small craft and she has done so with such wholehearted energy that in the space of a year an official programme has been issued calling for the construction of 94 airships to be completed during an especial five years' plan. Even if one accepts, as has occasionally happened in Germany previously, that a number of these vessels probably will not materialise, and will merely remain on paper, it is evident that quite a number of airships will actually make their appearance in Russia during the next few years.

One must realise that the requisite conditions for a successful issue of airship development and operation are present in Russia is a much greater degree than in any other country. In contrast to America, for example, which is intersected by innumerable railway systems, and whose only limit to transport are the great oceans, and where geographical, physical, and economic transport reasons preponderate to make the employment of huge airships for air transport desirable, Russia requires of the airship not so much the crossing of vast distances, but primarily the unlocking of the large areas and isolated regions in her interior, including the great stretches of land in the northern half of Siberia.

Here, large airships are not at all a necessity, and would indeed in any number be much too costly, as every huge rigid craft requires at least one great shed for its accommodation. Far more suitable to the object in view would be, therefore, medium sized airships which can be non-rigid or semi-rigid types, which can be tethered in the open or to a very light stub mooring mast and in case of necessity could be quickly deflated and speedily re-erected. These are the types of lighter-than-air craft which promise most to Russia in the exploitation of Northern Asia because they are more economical and possess a better lift to weight ratio than large ships. In contrast to the present means of transport by river steamer and ice-breaker, airships possess far superior speed and can be operated the whole year round. The principal commodities for transport are suitable for carriage by the airship, they consist mainly of perishable and valuable freight, drugs, medicines, instruments, machine replacements, food, etc., and for the return journey furs and rare metals. Lastly, the airship is wonderfully suitable for the first investigation and for the photographic recording of the landscape of regions not yet penetrated.

Regarding airship production up to date, there are two large craft in construction, one in Leningrad being built under the capable direction of Pro. Worobjew, which is already assuming shape. Furthermore, at the new airship works at Dolgo Prutnaja, 19 km. from Moscow, tucked away on the line to Rybinsk in the valley of the Kljasma, two huge sheds are being erected, one of which is now ready and the second will be completed in 1933. A third, smaller and older airship works is in Moscow itself, near the Zagi (Central Seaplane Institute). Besides these there are several smaller sheds being built of wood which are capable of accommodating the smaller types of airship, and which are situated in several strategic places, notably on the Siberian railway near Krasnojarsk and Irkutsk, as well as the great river district centres, Turuchansk on the Jenissei, Jakutsk and Bulun at the middle and the mouth of the Lena River, and lastly Nishne-Kolymsk at the mouth of the Kolyma.

If one traces these points on the map one easily recognises the goal of the new communications organisation which is to open the entire ice-bound coasts of the Northern Seas, the Peninsulas and the far Jakuten district. In these places hydrogen gas plants and mooring masts, as well as meteorological and wireless stations will be erected in addition to the sheds. It will be observed that the entire region lies far more to the north of the trans-Siberian railway than the projected airship transport plans put forward by the German Director of the "Aeroarctic" Kapitan a.D. Dr. Bruns, which established as bases Turuchansk, Tunguskoje (Jenissei), Urusha, Olekminsk and Blagowestschonsk, though these so far have not materialised.

The new airship programme, besides laying down various bases and lines of communication, stipulates that the smaller types of airship be built to commence with and provides for a quick and steady expansion. When one considers that the earlier building programme found a conclusion with a little craft "Komsomolskaja Prawda" one realises that the new plan is designed to provide a steady increase both in number and size.

At Zagi, the U.K.1, named the "First of May," of 77,572 cub. ft. capacity, with two motors totalling 150 h.p., a top speed of 52½ m.p.h., and a cruising speed of 50 m.p.h., and carrying a crew of seven, has been built, and the U.K.2, of 176,300 cub. ft. and 450 h.p., practically completed.

In Leningrad there is nearing completion U.K.3, of 229,190 cub. ft. and 600 h.p., as well as U.K.4, of 246,820 cub. ft. This somewhat larger type likewise presents only an introduction, but there will be at least four examples built, the names of which are known, viz., "Woroschilow," "Prawda," "Ossoaviachin" and "Kolschosnik." Each of these four ships is estimated to cost ten million roubles. The foremost Russian paper, the *Prawda*, in the autumn of 1931 had already presented the sum of fifteen million roubles, the estimated cost of construction undertaken at that time, which was obtained by public subscription. Since then the paper has given every assistance to the State in the rousing of public interest. From the Government's side there comes, amongst other things, the decree that all great land estates and areas must place the revenues of a "Hectare" at the disposal of the airship constructors.

From 1933 onwards the construction of the commercial airship proper will commence, one of 1,304,620 cub. ft. capacity being laid down at Dolgo Prutnaja, and one in Leningrad of 705,200 cub. ft.

It is also worthy of note that extensive research work is being carried out in the field of metal-clad airships, one or two small examples of which are already in existence in America. This highly important and promising work is in the hands of the 73 years old, world-famous Pro. Ziolkowsky, who for the last ten years has been connected with schemes for transport services by lighter-than-air craft, and who now approaches the realisation of his ambitions in the commencement of a metal-clad airship of 2,820,800 cub. ft. Apart from this ship no details of design of the rigid class are known. Negotiations which have been proceeding for some time with the Zeppelin Company in Germany for the construction of a large rigid vessel have not yet been brought to a successful conclusion. Much interest has been aroused by the statements of Engineer Kusskin, who has supervised the construction of an airship for the route between Leningrad and Vladivostok, and who estimates that the time taken between both places by the railway (some 220 hours) will be reduced to 77 hours by airship.

Of prominent Russian authorities associated with the sphere of airship construction, there are, besides those already named, Baranow, the Chief of the Russian Air Force; Sarsar, the President of the Ossoaviachim (the Russian Society for the furtherance of Air Travel). Gen.

Nobile, whose adventures with the *Italia* in the far north will be remembered, is acting as constructional adviser. Furthermore, there are engineers Flaxerman and Assberg, and the scientists Samoilowitsch and Moltschanow, and lastly the airship commanders and engineers Nishewski and Garakhanidse.

As will be seen, there is gathered under the control of the State a whole series of undertakings with the ultimate object of the exploitation of Northern Siberia, making that the goal of regular airship transport services, the investigation of as yet unexplored Polar regions, the making of photographic records, the direct crossing of Siberia and the accomplishment of pure experimental building.

Such comprehensive and far-reaching plans and efforts to assist in the evolution of the airship should at least command our attention and interest, and in view of the fiasco in this country with our own ill-fated craft, should not be commented upon with disdain. We have, indeed, much to learn.

Queensland Goldfields Air Service

WHAT is, perhaps, the most meteoric growth in a small town population witnessed for many years has taken place at Cracow, Queensland, where the latest mining developments increased the number of residents from 135 to 1,500 in the course of a few weeks. The chief link between the goldfields and Brisbane is by air owing to the inaccessible nature of the country, which makes it impossible to cover the distance of 236 miles by surface transport in less than two days either way. Travelling by air it is possible to leave Brisbane at 7 a.m. and to arrive at the field at 10 a.m., with a clear day ahead to make investigations before returning by air to Brisbane in the late afternoon. The service is availed of largely by city financiers and others who find it necessary to keep in constant touch with new developments on the fields. The Shell Company organises fuel and oil supplies for the Qantas taxi machines employed on this route, and the flights are regarded as demonstrating in a very definite manner the flexibility of air travel to meet urgent transport requirements in less-developed parts of the country.

Air Mail Profits and Losses

ON November 14 Lord Apsley asked the Postmaster-General whether the charges made against foreign postal administrations on account of their air mails carried on British air mail routes were based on the gold franc ; if so, what had been the increase of Post Office revenue from such sources since the suspension of the gold standard ; and whether any arrangements had been made to allocate part of such increased profits to the assistance of such British air mail routes. Sir K. Wood said the reply to the first part of the question was in the affirmative ; as regards the second part, the surplus collected by the Post Office was estimated at about £16,000 a year. This sum had been utilised to cover the loss on the conveyance of British mails by Imperial and foreign air services and had enabled the Post Office to avoid increasing the rates charged for air correspondence posted in this country.

Iraq Air Mail Discontinued

THE Postmaster-General announces that the Wednesday air mail despatch to Iraq has been discontinued. In future air mail correspondence for Iraq will be despatched only by the England-India air mail service. the latest time of posting for which is 11.0 a.m. on Saturdays at the General Post Office, London.

A New Air Line

STARTING from April 1 next year, a regular air service will be run between Heston and Cowes. It is intended that two trips will be made each way daily, and the single fare will be 25s. Buses will take passengers to and collect from Devonshire House, Piccadilly, London, and the pier at Cowes respectively. The machines to be used will be Spartan "Cruisers" with "Hermes IV" engines which, with a cruising speed of 120 m.p.h., will enable passengers to be landed at Devonshire House 1½ hr. after leaving Cowes. The running of this service will be by way of demonstrating the suitability of the Spartan "Cruiser" for such work. It was built for utilisation on feeder lines, and there is no doubt that the successful operation of this proposed service will be the best means of proving the Spartan Aircraft Co.'s contention that their machine is one of the best for the purpose.

The Aéropostale Affair

M. ANDRE BOUILLOUX-LAFONT, Director of the Cie Aéropostale, has been arrested on a charge of uttering forged documents. In a debate in the French Chamber, M. Painleve, Minister for Air, said that the pilots and personnel of the line had done their duty splendidly, and it was not their fault if the megalomania of some of the directors had imperilled the existence of the company. He stated that during eight years 39 pilots, 27 wireless operators and other employees, and 20 passengers had lost their lives—86 fatalities for a million and a half miles flown.

Obstacles of Indian Air Mail

LT. COL. H. BURCHALL, in a lecture before the Royal Central Asian Society, described the difficulties experienced by Imperial Airways in obtaining permission from foreign Governments to fly through their territory. In October, 1926, the Cairo-Karachi service was held up. In 1929 the difficulty was overcome and permission given for the service to operate for three years, but on the expiry of this period the Persian authorities wished to choose the air route through their country themselves, which again upset matters for a time. Difficulty had been also experienced in negotiating with the Italian Government concerning the service between Genoa and Naples. Again, when it was decided to give up the Persian route along the Persian Gulf, negotiations with the various Sheiks along the coast of Arabia were exceedingly troublesome and tedious. One Sheik was prepared to allow service machines to use his territory, but objected to civilian aircraft. Another Sheik was more accommodating, but fell ill and changed his mind. Eventually it was arranged to use land machines and an eleven years' agreement was signed with the Sheik of Shangah.

"COMFORT, WARMTH, AND A CLEAR OUTLOOK"

A Short Test of the Monospar

A SHORT flight on the Monospar with two passengers was enjoyable despite foul visibility and north-easterly chill. In fact, we know of no pleasanter aeroplane in which to give "baptêmes d'air," since comfort, warmth, and confidence, with conversational possibilities, are characteristics of this type. With no idea of noting technicalities, it was evident from the moment of opening of the throttles that here was a lively aircraft. The take-off was remarkable. In the air the machine climbed well without being unduly critical as to correct airspeed or attitude—which may be as important to the average pilot as the precise rate of climb.

The Monospar handled beautifully throughout its speed range ; its controls were pleasingly arranged, and its instruments, without obtruding, were plain to both front-seat occupants. The seating arrangement, comfort, and outlook were strongly reminiscent of an expensive four-seater saloon car. On the machine flown, the brakes were badly set, but the manner of their operation (rudder-bar and racing-handbrake type of control) is particularly sound. On landing, the port engine having stopped, was primed, and restarted without effort, in about 15 sec. One has heard criticisms of the elevator control. The fact, as it appeared to us, was that there was one very slight although distinct "snatch" during any large increase of incidence with engines on, *e.g.*, in entering a medium turn. Nothing in the nature of actual vice was found, although very slow flight and straight stalls were done.

This aeroplane bears the hall-mark of the practical pilot-designer in general and in detail ; consequently on a purely practical flying test it is extremely appealing to the pilot. Ease of blind flight is an excellent criterion of harmony of control, and although flying the type for the first time we had no difficulties in a bumpy blind period of 20 min. or so. Landing (and indeed flying in general) was exceptionally easy. The writer would enjoy teaching an "ab initio" pupil on this aeroplane—and believes he would break a "record" in the process, but nothing else.

W. E. J.

AIRPORT NEWS

CROYDON

WEATHER conditions, although not altogether favourable, have been considerably better than the previous week, and practically all the air services have been maintained without any serious delay or interruption. There has been considerably less local flying, however, and very few pleasure flights have been made. Nevertheless, there have been many visitors to the aerodrome, and the guide has been kept busy conducting parties of sightseers around the airport.

The change in the weather on Sunday, November 20, was greatly welcomed by Mr. Georges Seversky, who was returning to Cannes. His police permit expired at midnight, and as there had been no air services to Paris the previous day, he had almost made up his mind to a long and tedious journey by boat and train when conditions became better, and he was able to reach his destination by what he considers the best mode of travel.

Mr. R. A. Jahn, the manager of the Deutsche Luft Hansa at Croydon, flew to Berlin on Monday, where he is attending the meetings of station managers from the various aerodromes of the D.L.H. Mr. Jahn is expected to be absent from Croydon for about a fortnight.

Mr. Rollason reports that his firm is at present busily engaged at Ford aerodrome overhauling six planes of their own for C. of A.'s and six planes for private owners. The school at Ford has been very active, and flying tuition has been given to the full extent of the time permitted by the weather.

Mr. Victor Smith was expected to complete his flight from Cape Town to Croydon on Wednesday. News was received early in the afternoon that he had reached Marseilles, but shortly after 6 p.m. a message stated that he had landed at Avignon and would leave for Croydon at 3 a.m. On Thursday, he was reported to have left Avignon at 6.50 a.m., and then there was no news of him for several hours. In the meantime a large crowd of newspaper reporters and camera men arrived at the aerodrome. Later a report rapidly circulated that Mr. Victor Smith's machine had been seen to pass over Lympne and that he would reach Croydon shortly after 1 p.m., but this information proved to be false. About three hours later a farmer telephoned to Croydon to say that Mr. Smith had been forced down by a heavy rainstorm and had landed in a field near Hothfield railway station, about four miles from Ashford, Kent, and was unable to restart his engine. After several consultations had been held, it was decided to send a plane to bring the unfortunate airman to Croydon. Lt. R. R. Bentley and Capt. Muir left in a Desoutter ; it was raining heavily when they located the place where Mr. Smith had landed, and by the time they reached Croydon it was dark. The aerodrome floodlight afforded the camera men a good opportunity to take photographs. Mr. Smith looked none the worse for his adventure.

While everyone at Croydon extend their good wishes and admiration to those who engage in stunt flying and record breaking, it is felt that the time has come when some distinction should be made between the different branches of aviation carried on under the title of Civil Aviation. Those engaged in the direction of serious business undertakings, such as air-line companies, would prefer that their part in the flying world should be termed Commercial Aviation, while other forms of civil aviation could be known as Private Aviation. It is also felt that the arrival of stunt flyers at Croydon is likely to interfere with the arrival and departure of air liners, and that people engaged in stunt flights should therefore make arrangements to fly to and from such air parks as Heston and Hanworth, where this type of aviator is catered for and is naturally welcome.

Sir John Simon arrived by the Imperial Airway's air liner " Heracles " from Paris on Saturday morning. Sir John, who was returning from Geneva, was accompanied by Col. Seymore. They were met at the airport by friends and drove away almost immediately.

Capt. Birkett, of Birkett Air Services, Ltd., visited Croydon in his " Puss Moth " on Saturday afternoon. He was accompanied by a photographer, and had been engaged in taking aerial photographs of the new powered gliders at Hanworth, which proved to be no easy task on account of the difference in the speed of the " Puss Moth " and that of the gliders.

The total number of passengers for the week was 641 ; freight, 40 tons 5 cwts. HORATIUS.

FROM HESTON

THE weather on Monday, November 21, was brilliant, and Banco were early off to Berck with one passenger in their " Puss Moth," returning after lunch with an invalid from the hospital at Berck. This passenger was delighted with the smooth passage and considered it the best means of travel for his needs. Mrs. Fairlie arrived from Berck in her " Klemm," after a very cold journey. Mr. G. Lacombe, the agent in France for the Comper " Swift " Co., left for the Paris Aero Show in Comper " Swift " G-ACAG. One of the flying school machines was specially chartered for photographic work, which had been held up owing to the mist.

Wednesday, November 23, at the commencement of the day was blowing a gale, but after a heavy hail storm about noon, the wind calmed down and a good deal of flying was carried out up to dusk. Among those flying in school machines were Lady Haddington with her sister, Miss Cook, and Visct. Borodale. Mr. W. R. dea Voeux, Grenadier Guards, and Mr. G. E. W. Porter, Grenadier Guards, qualified for their " A " licence.

Customs on Thursday, November 24, were solely occupied with foreign machines. Heer Ten Bos arrived from Rotterdam in his " Pander "; Mon. Clermont-Tonnerre from Paris in a " Caudron," with Mon. Bideau as passenger, returning later in the day.

Friday, November 25, the Marquis of Douglas and Clydesdale cleared Customs soon after 8 a.m. and was off to Paris by 8.30 a.m. in a " Moth " with one passenger. From Paris they are proceeding to Switzerland. Later in the morning a member of the Household Brigade Flying Club left for Paris in his " Moth " with one passenger. Lord Apsley left at 9.30 a.m. in his " Parnall Elf " to attend a Hunt meet at Bristol, for which he was suitably attired. Visct. Carlow arrived from Paris flying Mrs Vereker's " Puss Moth."

Banco, on Saturday, November 26, had a charter to Paris with the Fokker, which left at 8.30 a.m. with eleven passengers, piloted by Capt. Barnard. Soon after a private owner left in his Avian for Berck with one passenger. The private owner returned to Heston owing to cloud being down to the ground at Dorking, and Capt. Barnard landed his passengers at Littlestone, most of them completing their journey by boat and train. Capt. Birkett, of Birkett Air Service, had a charter to take photos of machines in flight. As they were slow flying and there was a high wind it was difficult for him to keep his speed down sufficiently, he being in a " Puss Moth."

One new pupil joined the flying school. Our first two pupils during the morning were ladies taking advanced instruction with Capt. Baker. In spite of the high wind a full booking list was accommodated.

The visibility on Sunday, November 27, was simply wonderful after the bad weather we have been experiencing, but the high gusty wind somewhat interfered with instruction. After lunch our old friend " rain " arrived, but still instruction continued. There were many visitors to Heston, both by air and road, and the restaurant was crowded during the lunch time, also for tea.

There was an early demand for Customs—one " Kestrel Hart " (G-ABMR), pilot Mr. Lucas, and one " Pegasus Hart " (G-ABTN), pilot Mr. Sayer, leaving at 9.25 a.m. for Paris. The next to clear was an Autogiro (49-1), piloted by Capt. Rodriguez, which set off for Madrid, it having been purchased by the Spanish Government. One private owner arrived from Paris in his " Moth " with one passenger.

Visct. Borodale left in his " Puss Moth " for Sywell.

MR. L. IRVIN VISITS BERLIN

IN the fall of the year it is courting delay to venture on an aerial business tour to the Continent, but it is still tempting when the speed and warm comfort of a cabin aeroplane like the "Puss Moth" is compared with the slow and monotonous land passage, a temptation becoming irresistible if the skies are light and fair at the scheduled starting hour.

Allied with a wish to test his new "Puss Moth," G-ABYU, such a temptation prompted a recent trip to Berlin and back by Mr. Leslie Irvin, the parachute manufacturer. Leaving his private aerodrome near Ashwell in Hertfordshire on October 19, with Mr. Charles Dixon as passenger, he steered a direct course for Lympne in mid-morning, too late to complete the whole course of about 650 miles in the day's remaining light unless exceptional conditions favoured him. A clear but warmthless sunshine vivified the patchwork of fields and woods on the smooth swift passage towards the Metropolis, but the tourists soon saw that from London was drifting an opaque sea of fog across their track as they approached the hidden Thames east of London.

The fog, however, was defeated by the tourists and Heston A.A. Broadcasting Station with the "Standard" light-plane receiver as a medium. The weather report received led to the pilot submitting to fifteen minutes' "blind" flying cheerfully, knowing that there was excellent visibility and a wind of only 4 m.p.h. at Lympne. Only a smear of the Thames and the sharp flash of a glass roof indicated the passage past the capital. Came Lympne, lofty and looking isolated, with the Channel haze in the background. This stage of 90 miles had taken 50 min.

Customs observance and other formalities, and filling the tanks with twenty-six gallons of Pratts absorbed 30 min., and although Berlin then appeared more elusive for that day the bright atmosphere and a useful tail wind sent the tourists off at noon for Cape Gris Nez and Rotterdam.

Lympne-Rotterdam

The Channel shimmered in the path of the effortless progress of the "Puss Moth," and a few black shapes of boats moved imperceptibly in distant grey waters. Northern France stretched its dry flat fields southwards, and Calais soon crowded below. Ahead on a course of 83 degrees promised a joyride along a clear coast about 100 miles in length. Navigation could still lie dormant. With a fringe of curving foam the sand stretched on and on, an unlimited emergency landing ground. Famous seaside resorts, Blankenberghe and Ostend, rather exotic to the English eye, vividly clear in the sunshine, looked oddly deserted. Zeebrugge, with the sharply hooked arm of the Mole, seemed curiously modest for a place of its historical importance.

Challenging sights along this coast of France and Belgium were the canals. They cut towards the distant landward horizon with unerring straightness. With Holland came a totally different panorama. Like a giant's causeway lay the series of large islands, the well-defined contours of most being traceable from an altitude of 1,500 feet. They lay as flat as the sea and streaked with short canals. Congested Flushing looked a haven in this region of waters, lifting a dominating tower amidst a myriad of roof-points.

As the last narrow channel was crossed and the mainland of Holland regained Rotterdam was at once foremost in the mind, and in six minutes the "Puss Moth" was turning over the mass of docks, network of channels and silent shipping, and soon gliding down into the spacious aerodrome alongside. It was 1.30 p.m., and the stage of 170 miles from Lympne had taken 1 hr. 30 min.

Rotterdam-Hannover

When lunch had been taken and the tanks refuelled it was past 2 p.m., and, all conditions considered, the stage of roughly 240 miles to Hannover in Germany appeared negotiable before dark.

The "Puss Moth," therefore, turned out of the still bright air of Rotterdam at 2.15 p.m. and steered in sunshine a few degrees above the course for Amsterdam to strike the direct Amsterdam-Hannover route at a convenient point on the shore of the Zuider Zee, about 40 miles northwards.

The Zuider Zee curved clearly ahead about 20 min. later, with Amsterdam lying vaguely to the west, and the "Puss Moth" was turned towards its eastern shore. A short over-water stage led to the town of Harderwijk, directly situated on the Amsterdam-Hannover air route. Leaving the Zuider Zee on the given course of 97 degrees invoked a feeling in the tourists that they were then on the straight road for their next destination. The sun still coloured and softened the fields and clarified the canals of Holland, while the "Puss Moth" maintained a remarkable steadiness, making duty at the controls merely incidental. The Gipsy engine had not missed a beat, its faultless running almost banishing its humming presence from the tourists' minds. After flying about sixty miles on the 97 degrees course they were crossing the border into Germany, and soon great massing forests, were amongst the sights that indicated the change of country.

Germany's forests roughened the air, and for the first time since leaving England the "Puss Moth" rocked and bumped, jockeying over invisible disturbances.

Later on in rapidly darkening land a rounded sheet of water gleamed pale but distinct on a distant left. It was the Steinhuder Meer, a good landmark, at once informing the tourists that their course was bearing immediately upon Hannover. When the Meer was broadside it looked cold and remote in shadowed land with a solitary small island of skeleton trees inhabiting its nearest end. The end of the day's flight under a restful sky came quickly, rendered easy by the distinctive smoke flare burning centrally in Hannover aerodrome.

A smoke flare is as excellent for revealing an aerodrome to the approaching stranger as it is for indicating wind direction. It was 5.30 p.m. (German time) when the tourists landed, the stage from Rotterham having taken 2 hr. 15 min.

Berlin

In the morning the weather had broken. Fairly low cloud and rainstorms were prevalent on the route to Berlin, 155 miles distant, but the wind was still helpful.

Conditions proved not nearly so unpleasant as threatened. A few rain storms pelted down but the lowest clouds were not below 800 feet, and with the railway as an infallible guide Berlin was made in 1 hr. 20 min. As the "Puss Moth" passed across that great city the skies were dark grey and shrouded the distant outskirts, but a spectacular corridor of amber light circled the city above the grey gloom. Tempelhof caught the eye distinctly and beyond soon lay Johannisthal, the oldest flying field in Germany. Here the landing was made, and Herr Gerhard Sedlmayr, otherwise Autoflug, who is manufacturing Irvin parachutes under licence in Germany, met the tourists with his jovial presence and improving English, and was the perfect host as occasion arose during the visit.

Return Flight

On Monday, October 24, at 8.40 a.m., the return flight commenced in the teeth of a strong head wind and rain, and the stage to Hannover took about 2 hr. 28 min., just over an hour longer than the outward trip had taken. The "Puss Moth" landed at 11 hr. 8 min. Rain and the wind suggested a delay at Hannover, but the forecast of a drop in the wind later in the afternoon was enough inducement to venture into the grey heavily-laden atmosphere, and after struggling in the wind for about an hour the flight to Rotterdam was finished in comparative calm and in the excellent time of 2 hr. 25 min. Clear weather to Lympne was promised at Rotterdam, and after a very short stay the flight was resumed. Along the Belgian coast rain squalls beat down heavily between bursts of sunshine and rain also brought the monoplane down to 500 feet over the Channel, which was crossed direct from Calais to Folkestone.

Lympne was reached by 4 hr. 20 min. in 1 hr. 25 min. flying time, and fog over southern England, combined with approaching darkness, compelled a halt until the morning before the home aerodrome could be reached. Total flying time for the outward trip was 5 hr. 55 min., and for the homeward journey 7 hr. 18 min.

BOOK REVIEWS

"British Patents and Designs Statutes." As amended and consolidated to 1932. *Introduction and Index by H. J. W. Bliss, B.A., F.I.C., Barrister-at-Law. (Stevens & Sons, Ltd.,* 1932.) *Obtainable from* FLIGHT *Office.* 5*s. post free.*

A USEFUL short commentary on the changes of Patent and Design Law just enforced. Of interest to those who have to refer from time to time to the Acts and who already have a working acquaintance with Patent Law.

"Airplane Pilot's Manual." By Ross Mahachek (Putnam's Sons, Ltd.) Obtainable from FLIGHT *Office. Price 21s. 9d., post free.*

MR. MAHACHEK has succeeded where nearly all others have failed. His book, which is *really* a manual of flying training, is lucid, accurate and complete. It presents the real facts of flying technique in such excellent manner that the reviewer, himself an instructor who claims advanced ideas and considerable experience, has benefited substantially by reading and re-reading the book.

A most valuable feature of the book is the vigorous and clear attack made on popular fallacies. Many instructors know that certain observances in flying are necessary to safety, but it is often extremely difficult (not to say annoying) to convince a pupil who has already acquired fallacious information, that such observances are not only desirable but theoretically justifiable. One is particularly struck with the clear exposition of wind-gradient effects in approaches and take-offs. The article on the vagaries of compasses is the first in print (so far as the reader's knowledge goes) to deal completely with all confusional errors. (See article in FLIGHT for September 30, 1932.)

The book is of a length and scope to forbid a detailed analysis, but it is seriously recommended for all clubs and all keen instructors and pupils.

There is controversial matter ; without it the book would lose value. For example, the method of approach for a forced landing will annoy " die-hard " instructors of the British school, and there are one or two minor contradictions, *e.g.*, on page 111 where the height of recovery from turns is given at 40 ft. as a low limit, whereas elsewhere one understood 200 ft. as being a dictate. Also, there is perhaps undue emphasis throughout on " crossed control " correction for yawing effects on the ground, and in prevention of ground-loops, for example. With many British aircraft the principle of " ruddering towards the dropping wing " is, of course, applicable as stated, but it is often desirable to combine with aileron to the same side, particularly in the early stage of a landing run, to prevent wing-dropping.

Such points, well argued as they are, are merely salt lending piquancy to an admirable dish.

W. J.

"L' Annee Aeronautique, 1931-1932." *Compiled by L. Hirschauer & Ch. Dollfus. (Dunod,* 92, *Rue Bonaparte, Paris.)*

THE annual for the current year, which is the 13th edition, contains a useful catalogue of the world's most used aircraft, accompanied by illustrations, followed by short descriptions of the best known aircraft engines. An interesting chart shows the progress of various records and a short description is given of those broken during the current year. The various aeronautical competitions, flying meetings, and great flights of the year 1931-1932 are recorded, and special note is made of Professor Piccard's great adventure into the stratosphere. Towards the end of the volume will be found set down the activities of the chief commercial air lines of different countries, and it is of special interest to note that the compilers seem to have gathered very little information concerning the aerial activities of the Soviet administration in Russia.

"Fighting Planes and Aces." By W. E. Johns (John Hamilton). Obtainable from FLIGHT *Office. Price 5s. 6d. post free.*

IN this book will be found a short description and history of the machines which made aeronautical history during the war, also a short biography of the various pilots who made their names famous, and a brief description of their exploits. The author is to be congratulated on making no attempt to conceal the gallantry which was shown by German and Austrian pilots who fought against us. The illustrations by Howard Leigh are well worthy of special note.

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" Air Survey " at the Royal Aeronautical Society

ON Thursday, December 8, Lt. J. S. A. Salt, R.E., will lecture before the Society on Air Survey. Lt. Salt has for the last three years been the Research Officer to the Air Survey Committee, and has carried out experimental surveys in Egypt and Sinai and in the Aden Protectorate. Lt. Salt will cover a wide field, from the value of survey to the actual methods of making the survey, air photography, ground survey and drawing office work, Imperial survey organisation and future developments. The lecture will be delivered at 6.30 p.m. in the Lecture Hall of the Royal Society of Arts, 18, John Street, Adelphi, W.C.2, at 6.30 p.m., and will be illustrated.

India Round Table Reception

AT the Reception held by His Majesty's Government on November 23 at Lancaster House, in honour of the delegates to the Indian Round-Table Conference, the following were amongst those who accepted invitations:— Sir Christopher and Lady Bullock, Air Marshal Sir R. and Lady Brooke-Popham, Air Vice-Marshal H. C. T. Dowding, Air Marshal Sir E. Ellington, Sir Samuel and Lady Maud Hoare, Sqd. Ldr. and Mrs. Hodsall, Wing. Com. and Mrs. A. W. H. James, Lt. Col. J. T. C. Moore-Brabazon, Air Chief Marshal Sir John and the Hon. Lady Salmond, Lt. Col. and Mrs. F. C. Shelmerdine, Rear Admiral M. F. Sueter, the Duke of Sutherland, etc.

British Motor Boats for Abroad

THREE motor-boats produced by the Power Boat Company are to be taken abroad for demonstrating to various foreign countries. The largest of these boats, a 200-h.p. tender, 37 ft. 6 in. long with a speed of 30 m.p.h., was built originally for the R.A.F. The other two boats are smaller, and also of a type supplied to the R.A.F. The essence of design incorporated in these boats is a flat-bottomed hull with a high efficiency propeller and rudder which gives speed and control at low power.

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Royal Air Force Display, 1933

THE fourteenth annual Royal Air Force Display will be held at the Royal Air Force Station, Hendon, on Saturday, June 24, 1933.

Aero Services, Ltd. (South Africa)

AERO SERVICES, LTD., have offered to centre their activities at the new Municipal Airport at Wingfield, Cape Town, as they consider it would be advantageous to all concerned to have flying in the Peninsula concentrated at the one aerodrome, but so far no encouragement has been received from the local Airport Committee. In the meantime the company are forging steadily ahead with school work, pleasure flying, etc. Since August 1 instruction has been given to 13 persons ; three are already flying solo, and others are approaching this stage. A Cirrus " Avian " has been utilised for school work, and the company's Hermes Spartan has done a considerable amount of flying on cross-country trips, pleasure flights, aerial photographic work, etc.

Kite Flying over Hull

AIR MINISTRY Notice to Airmen, Series A, No. 70, of the year 1932, states that a kite may be flown, by day and night, up to a height of 2,000 ft. from a position 2 miles E.S.E. of Cottingham to the north of Hull, the mooring cable will be marked in accordance with the Air Navigation Order.

Dinner to Mrs. Mollison

THE Women's Automobile and Sports Association are arranging a dinner of welcome to Mrs. Mollison on her return from South Africa. A committee has been formed which includes the Marchioness of Carisbrooke, Viscountess Elibank, Lady Iris Capell, Kathleen Countess of Drogheda, Mrs. Shelmerdine and Miss Winifred Spooner.

Enquiries regarding the B.G.A. Reception to Mrs. Mollison should be addressed to the Secretary, British Gliding Association, 19, Berkeley Street, W.1, or telephoned to Mayfair 4032.

THE INDUSTRY

THE STORY OF DUNLOP

QUITE an interesting story of how the late J. B. Dunlop invented the pneumatic tyre has been written by his daughter, Jean McClintock. The inventor was a veterinary surgeon by force of circumstances, but his natural inclination lay in things mechanical and scientific. His first tyres were not worn out after 3,000 miles running, and a front tyre that he designed for a racing bicycle built in 1889 was in good condition after 8,000 miles, and was ridden by him as late as 1917. Dunlop did not, as one story suggested, ever resort to hose pipe in his early experiments. He knew that the material was too inelastic and would be much slower than a solid tyre.

VACUUM OIL CONTRACT

THE Vacuum Oil Company of South Africa, Ltd., have received a contract from Sir Alan Cobham covering his entire petrol requirements during his forthcoming South African Tour. Pegasus Motor Spirit and Pegasus Aviation Spirit will be supplied, and a Pegasus petrol tank wagon will accompany the tour throughout. In addition, Sir Alan Cobham's circus will have the assistance of the Vacuum Oil Company's "Avian," piloted by Mr. Louw.

AIRCRAFT COMPONENTS, LTD.

SINCE Aircraft Components, Ltd., introduced their shock-absorber strut to the aircraft industry they have received a succession of satisfactory reports, and within twelve months this component has been adopted by 15 aircraft manufacturers.

Our readers will be familiar with the fact that the strut is the design of Mr. G. H. Dowty, managing director of the company just named. It is an all-metal strut offering very low resistance combined with exceptional lightness. As a standardised unit it has the merit of requiring no maintenance, no adjustment of glands, and there are no parts to deteriorate. Occasional oiling is all that is needed.

The greater number of spring units employed the smaller will be the strut diameter. The number of units that can be used is limited by the pin-centre length of strut and the spring travel required, but the strut width seldom exceeds one half that of other struts having similar shock-absorbing capacity. The latest type struts of Dowty design incorporate a device for perfectly controlling spring recoil. This prevents unsteadiness during taxying, or bouncing of the aircraft on landing.

During strut closure a quantity of oil is forced into a chamber above the piston, and any outward movement of the strut causes a disc valve to close this chamber. A small port in the disc valve restrains outward movement but allows the springs to return quickly enough to be in readiness for the next shock, yet not so quickly as to cause bouncing. All the vertical landing energy is absorbed during the first closure of the strut. With regard to maintenance, an oil filler plug lies flush with the outside of the strut and this is removed periodically and oil poured into the strut by means of a funnel until it overflows. Filling can be done with the strut in any position.

The latest aircraft on which the Dowty strut has been standardised is the Saunders-Roe "Cloud." Aircraft Components, Ltd., have received a favourable report from National Aviation Day, Ltd., concerning their undercarriage design on the Airspeed "Ferry" machines after the gruelling campaign round Great Britain this summer. A total of 9,180 landings were made by these machines in six months.

CIRRUS-HERMES INFORMATION

THE latest folder issued by Cirrus-Hermes Engineering Co., Ltd., describes their range of light aero engines from the 85/95-h.p. Cirrus III to the 120/130-h.p. Hermes IV. All unnecessary data are left out, leaving clear and essential information, covering the specifications and installation details. A companion folder is also issued in French, and interested parties can obtain this useful information on application to the company at Croydon Aerodrome.

Our attention is drawn to errors in the captions under illustrations of the "Cirrus" engines which appeared on page 1116 of FLIGHT, November 24. The sectioned view shows a "Cirrus-Hermes II," not a "Cirrus-Hermes IV." The other illustration shows the latter.

A pair of shock absorber struts manufactured by Aircraft Components, Ltd. for the Saunders-Roe "Cloud." This type of strut is standard on the "Cloud."

SPARTAN AND THE NAPIER ENGINE

IN a report of an oil test using "Adcol N.P.5" Aero Engine Oil in FLIGHT for November 24, it was stated that Airwork, Ltd., fitted the Napier engine during the test in the "Spartan" fuselage. Actually, of course, the installation of the engine was entirely the care of Spartan Aircraft. Ltd., the designers and constructors of the aircraft ; this firm also carried out the initial test flights, so that when the machine was handed over to Airwork, Ltd., it was in possession of a full C. of A. The latter firm then went ahead and supervised the remaining large number of flying hours of which the test was constituted.

CHRISTMAS GIFTS

A CHRISTMAS gift display is being arranged for December by London and Provincial Aviation Co., 3, Thackeray Street, Kensington Square, W.8, consisting of accessories, maps, books, instruments and other objects suitable as gifts for those interested in aviation.

The display of "Standard" radio equipment at the Paris Aero Show. It included a receiver for light aircraft, two combined transmitting and receiving sets for large or medium-sized aircraft, and a transmitter and receiver for fighting aircraft. The apparatus seen in the centre of the display is an aerodrome transmitter.

THE ROYAL AIR FORCE

London Gazette, November 22, 1932.

General Duties Branch

Pilot Officer on probation R. H. Maw is confirmed in rank (Oct. 1); Pilot Officer A. M. Rodgers is promoted to rank of Flying Officer (March 26); Flight Lieut. J. F. Titmas is placed on half-pay list, Scale A, from Aug. 8 to Oct. 23 inclusive and from Oct. 26 to Nov. 5 inclusive (substituted for *Gazette*, Aug. 16); Lt. A. G. Poe, R.N., Flying Officer R.A.F., ceases to be attached to R.A.F. on return to naval duty (Nov. 15). The short service commn. of Pilot Officer on probation H. D. Parsons-Smith is terminated on cessation of duty (Nov. 23). The short service commn. of Acting Pilot Officer on probation, R. C. Beaven is terminated on cessation of duty (Nov. 23).

ROYAL AIR FORCE RESERVE
RESERVE OF AIR FORCE OFFICERS

General Duties Branch

N. Richardson (Lt. R.N.R.) is granted a commn. in Class A.A. (i) as a Pilot Officer on probation (Nov. 10). The following Flight Lieutenants are transferred from Class A to Class C:—G. I. Thomson, D.F.C. (Aug. 4); A. D. McDowall (Oct. 2); W. G. Nicholls (Nov. 18).

The following Flying Officers relinquish their commns. on account of ill-health (Nov. 23):—L. G. Brazier, F. B. Young.

Flying Officer (Hon. Flight Lieutenant) D. S. Cairns (Captain, Rifle Brigade, R.A.R.O.) relinquishes his commn. on completion of service and is permitted to retain rank of Flight Lieutenant (July 8).

AUXILIARY AIR FORCE

General Duties Branch

No. 603 (CITY OF EDINBURGH) (BOMBER) SQUADRON.—Flying Officer T. M. McNeil is promoted to rank of Flight Lieutenant (Oct. 25).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Wing Commander G. H. Bowman, D.S.O., M.C., D.F.C., to Experimental Section, Royal Aircraft Estabt., S. Farnborough, 15.11.32, for Flying duties, *vice* Sqd.-Ldr. W. S. Caster, M.C.

Squadron Leaders: A. S. Maskell to No. 99 (B) Sqdn., Upper Heyford, 13.11.32, for Flying duties. L. H. Cockey, to No. 14 (B) Sqdn., Amman, 29.10.32, to Command, *vice* Sqd.-Ldr. F. O. Soden, D.F.C. F. O. Soden, D.F.C., to H.Q., Transjordan and Palestine, Jerusalem, 1.11.32, for Air Staff duties, *vice* Sqd.-Ldr. F. W. Walker, D.S.C., A.F.C. E. J. D. Townesend, to Air Ministry, Dept of A.M.S.R. (D.D.R.M.), 15.11.32, for Engineer Staff duties. C. W. Hill, to H.M.S. *Glorious*, 16.11.32, for Engineer duties, *vice* Sqd.-Ldr. H. L. Macro, D.F.C., A.F.C.

Flight Lieutenants: W. J. Millen, to Station H.Q., Hinaidi, 29.10.32. R. H. Donkin, to School of Tech. Training (Men) Manston, 1.11.32. F. Woolley, O.B.E., D.F.C., to No. 100 (B) Sqdn., Donibristle, 17.11.32.

Flying Officers: A. M. Watts-Read, to No. 20 (A.C.) Sqdn., Peshawar, 9.10.32. R. Mountain, to No. 22 (B) Sqdn., Martlesham Heath, 14.11.32. B. J. Hurren, to R.A.F. Base, Gosport, 10.11.32. R. C. H. Crosthwaite, to No. 448 (F.S.R.) Flight, 11.11.32. D. G. Morris, to No. 460 (F.T.B.) Flight, 15.11.32.

Pilot Officers: P. Bathurst, to No. 47 (B) Sqdn., Khartoum, 1.11.32. R. E. Barnett, to No. 6 (B) Sqdn., Ismailia, 1.11.32.

Stores Branch

Squadron Leader F. H. Sims, to Home Aircraft Depot, Henlow, 14.11.32, for Stores duties.

Accountant Branch

Wing Commander J. L. Robertson, to H.Q., Iraq Command, Hinaidi, 29.10.32, for duty as Command Accountant, *vice* Wing Com. J. Rylands.

Medical Branch

Squadron Leader F. E. Johnson, to R.A.F., General Hospital, Hinaidi, 29.10.32, for duty as Medical Officer.

Flight Lieutenants J. Parry-Evans, to R.A.F. Hospital, Aden, 21.10.32. A. R. French, to Station H.Q., Northolt, 25.11.32.

Flying Officers: J. A. Kersley, to R.A.F. General Hospital, Hinaidi, 29.10.32. A. M. Weston, to No. 8 (B) Sqdn., Khormaksar, Aden, 21.10.32.

Chaplains Branch

Reverend H. F. Daniels, to No. 4 Flying Training School, Abu Sueir, 1.11.32, for duty as Chaplain (Methodist).

S S S

Use of Private Aircraft by R.A.F. Officers in Egypt and the Sudan

WITH reference to K.R. & A.C.I., para. 800, R.A.F. officers are now permitted to keep private aircraft in Egypt and the Sudan. The import of aircraft into the Sudan is controlled, however, by the Arms, Ammunition, and Explosives Ordinance, 1932. In order that arrangements may be made with the Sudan Government for the issue of the necessary import licence, officers serving in or being transferred to the Sudan, who desire to keep private aircraft there, are to apply for permission to do so, through the usual service channels, to the A.O.C., Middle East.

Kenley Aerodrome

DURING the period of reconstruction of the Royal Air Force Station, Kenley, normal facilities for the landing and refuelling of aircraft will not be available, and the use of the aerodrome will be restricted to emergency only. A flare path will not be available, except in special circumstances, when arrangements should be made through Headquarters, Air Defence of Great Britain.

Move of School of Store Accounting and Storekeeping

THE School of Store Accounting and Storekeeping will move from Kidbrooke to Cranwell, with effect from December 1, 1932. The school will continue to be a separate unit after moving to Cranwell, and will be administered by the A.O.C., Cranwell, for such matters as are at present the responsibility of the A.O.C., Inland Area.

H.M.S. "Glorious"—Temporary Return to United Kingdom

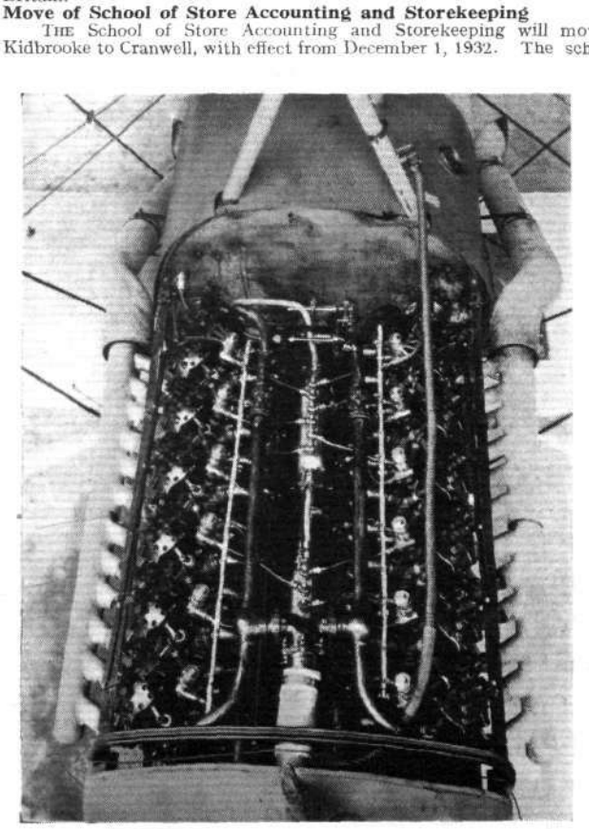
H.M.S. GLORIOUS arrived at Devonport from Malta on November 10, 1932, to undergo short refit. No. 405 (F.F.) Flight and No. 460 (T.B.) Flight were ordered to return in H.M.S. *Glorious* and disembark on arrival. The date of the return of H.M.S. *Glorious* to Malta will be published later.

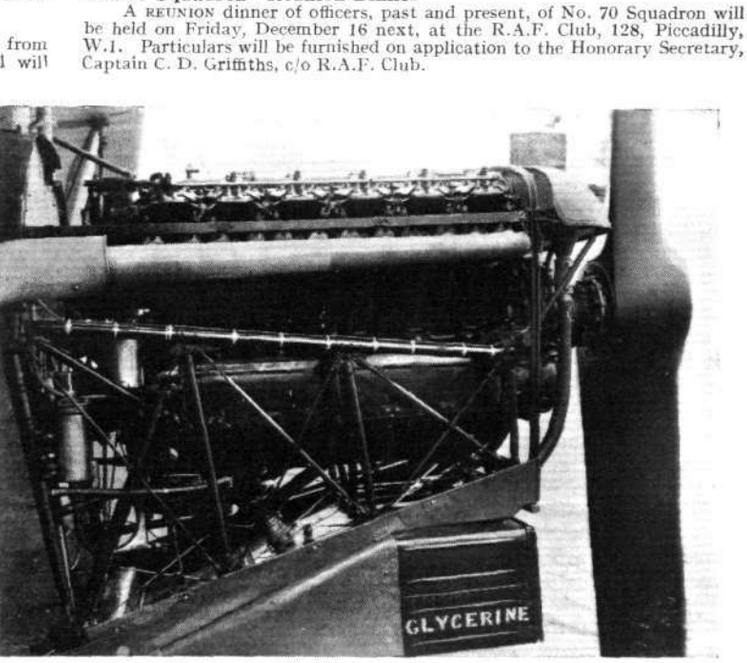
The R.A.F. Staff College

THE following officers have been nominated by their respective Dominion Air Boards to attend the eleventh course at the R.A.F. Staff College, beginning January 23, 1933:—*Royal Australian Air Force*: Flight Lieutenant E. C. Wackett, Flight Lieutenant J. P. J. McCauley. *Royal Canadian Air Force*: Flight Lieutenant A. L. Morfee, Flight Lieutenant J. L. E. A. de Niverville.

No. 70 Squadron—Reunion Dinner

A REUNION dinner of officers, past and present, of No. 70 Squadron will be held on Friday, December 16 next, at the R.A.F. Club, 128, Piccadilly, W.1. Particulars will be furnished on application to the Honorary Secretary, Captain C. D. Griffiths, c/o R.A.F. Club.





COMPRESSION-IGNITION: Two views of the Rolls-Royce "Condor" installed in a Hawker "Horsley." Test flights are about to commence.

(R.A.F. Official Photographs, Crown Copyright.)

AIR POST STAMPS

By DOUGLAS ARMSTRONG

New Nicaraguan Provisionals

THE inauguration of an interior air mail service in the state of Nicaragua under the auspices of the Vias Aereas Nacionales S.A. on October 12, 1932, was attended by the surcharging of 2,000 copies of the contemporary 1 Cordoba air mail stamp (exterior), with the new value "8c" representing the local air post rate.

The actual wording of the overprint reads: "Inauguaracion Interior—12 Octubre, 1932—Vale C$.0.08," in three lines of black type, the 27th and 30th stamps in each half sheet of 50 having the second "u" of "Inauguaracion" inverted, and the 46th showing the incorrect date of "1232."

This was followed by the publication of a Presidential Decree ordering the remaining stock of earthquake commemoration stamps (Terremoto), originally issued on January 1, 1932, to be converted into provisional air mail stamps for the interior service by the addition of the inscription "Correo Aereo Interior—1932," in the form of an overprint, with or without the surcharge of new denominations in multiples of the inland air mail fee, viz., 8c., 16c. and 24c. Furthermore the regular government air mail stamps (Momotombo type) were to be overprinted "Interior 1932," as well as surcharged with new values 32 on 50c. and 40c. on 1 Cordoba, pending preparation of a distinctive series for local use. At the time of writing these provisionals have not materialised, but they may be expected to arrive by any South American mail.

Guatemala has likewise produced an emergency air mail stamp for internal use only consisting of the 3 pesos stamp of the 1926 series overprinted and surcharged in red "*SERVICIO AEREO INTERIOR 1932—Q.O.03.*"

Another Philippine "Special"

It is only upon special occasions that the post office department of the Philippines indulges in an issue of air post stamps. The last was in 1928 in connection with the Cave-Brown-Cave formation flight, and now he have another to commemorate the arricval at Manila of the German pilot, Wolfgang von Gronau, in his flying boat "Groenland-Wal" on September 27 last.

This time the issue comprises seven values of the current pictorial postage stamps of the islands, with the outline of a seaplane between the inscription "ROUND THE WORLD FLIGHT—Von Gronau—1932," superimposed in green or blue ink by means of electrotype plates, viz., 2c. yellow-green (view of Mayon Volcano), 4c. carmine (G.P.O., Manila), 12c. orange (Manila Bay), 18c. vermilion (Pansanjan Falls), 20c. yellow (rice cultivation), 24c. pure (rice terraces, Bontoc), and 32c. sepia (zig-zag road at Baguio). The total printing is said to have amounted to 20,000 sets, the intention being that they should be employed for the purpose of a special air mail to be despatched by Capt. von Gronau to Europe by way of Java, which was to be his next stop. Incidentally the "Groenland-Wal" brought 1,000 pieces of mail matter from Shanghai and Sourabaya for delivery at Manila.

Proposed Polish Commemoratives

A rather tragic interest attaches to the proposal to issue three particular stamps in celebration of the aerial exploits of the Polish air ace, Lt. Zwirko, who recently won the Round Europe challenge flight, for in the meantime he was killed in a flying accident.

Baltic Blague

The impending appearance in Latvia of a series of charity-postage stamps to be sold at a small premium upon face value in aid of aviators disabled in the following of their profession is unfortunately overshadowed by the fact that they are largely speculative in character. Actually they are being produced at the instigation of an American stamp dealing syndicate, and only a small part of the 20,000 sets ordered will be supplied to post offices, merely to give them the necessary validity, the balance being underwritten by the concern in question. As is well known, air post flights in the Baltic States are suspended from October to March on account of weather conditions, so that there is no likelihood of these so-called aero-stamps ever being used for aerial postage. It is the more regrettable because the subjects of the designs prepared by eminent Lettish artists are of exceptional interest, illustrating as they do the history of aviation from Icarus, da Vinci and Charliere to Wright and Blériot.

Unhappily the same remarks apply to a new series of triangular air post stamps emanating from the adjacent republic of Lithuania and adorned with historical scenes which is also a wholly unnecessary production in the interests of the American syndicate. Air post collectors will be well advised to fight shy of these two creations, so that the attempt to exploit them may prove so unprofitable to the governments and individuals concerned that they will not be tempted to repeat the experiment.

Stratospheric Air Mail

It transpires that when the Belgian, Professor Piccard, made his altitude record in the "stratosphere" he carried with him a small quasi-official air mail of about 50 letters. These were enclosed in souvenir envelopes franked with both Swiss and Italian stamps, and duly delivered on descent at Volta Mantuana (Italy).

By the way, the Belgian government has just issued three special stamps to commemorate Professor Piccard's achievement, all bearing a picture of the balloon "F.N.R.S.-00-B.F.H.," but they are ordinary and not air post stamps.

K.L.G. Air Sign

THE K.L.G. Sparking Plugs, Ltd., have painted an air sign, in white with a black outline, on the flat-topped building in the centre of their works on the Kingston bypass. The sign consists of the letters "K.L.G.," but apart from being an excellent advertisement it will act as a guide to airmen, for the sign includes two arrows, one with a "C" pointing to Croydon, the other with an "H" pointing to Heston.

Compers in France, Spain and India

THE Comper Aircraft Co. inform us that M. Jean Lacombe, who has been appointed Comper agent for France, has taken delivery of his "Pobjoy Swift," and that among orders recently booked are a "Gipsy Swift," which is going to India, and a long-range "Pobjoy Swift" the destination of which is Spain. While the "Swift" is selling strongly, the company is looking ahead and has started the construction of the Comper "Mouse." What the Comper "Mouse" will be remains at present a mystery which the firm is unwilling to solve, but that it will be something interesting those who know "Nick" Comper have no doubts. Presumably the first "Mouse" will be christened "Mickey."

PUBLICATIONS RECEIVED

Air Mails of British Africa, 1925–1932. *The "Aero Field" Handbook No. 2.* Compiled by N. C. Baldwin. Francis J. Field, Ltd., Sutton Coldfield. Price 2*s.* 6*d.*

Annual Report of the Smithsonian Institution. 1931. Superintendent of Documents, Washington, D.C., U.S.A.

Aeronautical Research Committee Reports and Memoranda. No. 1460, *Experiments with a Supercharged Single-Cylinder Unit.* By G. F. Mucklow, Nov., 1931. Price 3*s.* net. No. 1468. *High Speed Induced Wind Tunnel.* By A. Bailey and S. A. Wood. May, 1932. Price 1*s.* 3*d.* net. No. 1478. *Efficiency of Tail Plane Behind Wing of R.A.F. 34 Section.* By D. M. Hirst and A. S. Hartshorn. April 1932. Price 4*d.* net. London: H.M. Stationery Office, W.C.2.

NEW COMPANY REGISTERED

UGO ANTONI SAFETY AIRCRAFT, LTD. Capital: £5,000 in £1 shares. Under agreement with Ugo Antoni. Aeronautical experts and consultants, manufacturers of and dealers in aeroplanes, seaplanes, airships, parachutes, gliding machines, etc. First directors: Air Vice-Marshal Sir Chas. Laverock Lambe, K.C.B., C.M.G., D.S.O. (chairman), Ugo Antoni, 31, Old Compton Street, W.1. aircraft constructor; Riccardo Climatti and Guiseppe Vecchi, Solicitors: Heald Johnson & Co., 129, Wardour Street, W.1.

Increases of Capital

AIRWORK ENGINE SERVICE, LTD. (Heston Airport, Hounslow, Middlesex) —The nominal capital has been increased by the addition of £1,000 in £1 ordinary shares beyond the registered capital of £1,000.

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motors.

(The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

APPLIED FOR IN 1931

Published December 1, 1932

24,236. A. T. S. Co., LTD., and W. N. WYLIE. Ribs for aircraft wings. (382,979.)

29,976. ECLIPSE AVIATION CORPORATION. Fluid pumps. (383,042.)

31,168. BRITISH THOMSON-HOUSTON CO., LTD. Radio course-finding systems for aircraft. (383,059.)

35,017. BRISTOL AEROPLANE CO., LTD., A. H. R. FEDDEN and F. G. BUTLER. Power-transmission mechanism associated with multi-cylinder i.c. engines. (383,089.)

APPLIED FOR IN 1932

Published December 1, 1932.

9,750. R. E. GILLMOR. Gyroscopic compasses. (383,164.)

15,635. M. P. PATTIST. Device for determining drift, ground speed and bearing angles. (382,212.)